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We print this week the first of a series of articles on the Western Pacific, which will deal with location and traffic, engineering and finances of the road. The present instalment, covering location and traffic, has much of the enthusiasm of a prospectus (albeit somewhat modified by the editor) and was prepared in the interest of the road's bankers. Nevertheless, the information it contains is of the highest value, and should not be overlooked by any student of traffic and industrial conditions in the Far West. Barring the occasional setbacks of commercial depression, it is evident that the most rapid and interesting changes in the business aspect of the country are likely to occur in the great districts which have had relatively the least development. A road which opens up as much new territory as the Western Pacific, is a wonderful commercial developer, and the extent to which it is going to change its country in five years or in twenty-five years can only be guessed at. Moreover, while these changes are taking place, the man who regards the West or South of the present day as being the same West or South which he used to know, years ago, has a false picture in his mind. Next to seeing a country, the best way to correct that picture is to look at photographs of it, and hear it described by its friends.

Not a great while ago a contract was let to a British company for a railroad bridge to be built over the Blue Nile, at Khartoum. This will be the first bridge ever built over that great stream, except, of course, some possible but improbable foot bridges crossing the head waters, far up in the Abyssinian Mountains. The chief significance, however, is that this bridge will take the Soudan Railroad into the city of Khartoum. The southern terminus of that railroad is now on the bank of the Blue Nile, opposite Khartoum. The immediate advantage of having freight and passenger terminals in the city proper is obvious, but beyond that is the fact that any important further development of railroads in the Egyptian Soudan must be in the fertile territory between the White Nile and the Blue Nile; and by the building of the bridge any such projected development may be physically continuous with the Soudan Railroad. There is a break of a little over 200 miles, however, in the Soudan Railroad itself, from Assouan, at the first cataract, to Wady Halfa, where the traffic is now served by river. There is an unfortunate break of gage also between the railroads of Egypt and those of the Soudan, the Egyptian railroads being 4 ft. 8½ in. gage and the Soudan Railroad being 3 ft. 6 in. gage. Within a few months an important railroad has been built from the Red Sea to the Nile, as we have recently recorded. This railroad placed Khartoum within a little more than 300 miles of a good port on the Red Sea. Up to the present time the Soudan railroads have not been earning operating cost and interest charges, and it is very likely that it will be a good many years before they do so, but there are strategic and humanitarian advantages sufficient to offset the deficit.

The report, printed on another page, of the disastrous rear collision of passenger trains which occurred in Belgium last May, is from the pen of an officer of the state railroads, Mr. Weissenbruch, well known to many of our readers as the accomplished secretary of the International Railway Congress. It appears that the report which we gave at the time, based on the cable despatches, was essentially correct, except that the immediate error was made by the signalman and not by the repairman. The comment which we offered then also remains unchanged. The only satisfactory rule where interlocking is being altered or repaired is a rigid speed limit for all trains. The rules of the Lake Shore & Michigan Southern on this point, published in the *Railroad Gazette* of August 18, 1905, constitute a model code. As Mr. Weissenbruch observes, the enforcement of low speed introduces delays which may be irksome to operating officers, passengers and trainmen; but what officer familiar with this kind of work will dare say that any other rule can satisfy him when he is in bed at home at night? If we correctly interpret all that Mr. Weissenbruch says about these repair-regulations on the Belgian roads it would appear that in England and on the most advanced roads in America the requirements as to precautions are better than those of Belgium. Probably, however, the most pressing question in all three countries is as to the enforcement of the rules. A speed limit is one of the hardest things in the world to maintain, without constant watching. Judging by American experience frequent "surprise" slow-signals are necessary to give reasonable assurance that uniform obedience may be expected. To get the very best service one must go still farther and educate the consciences and the intelligence of the enginemen. This is more necessary in this particular than in many other features of the engineman's work, for the critical point in most situations is to see whether an engineman, after receiving a "slow-signal," does actually reduce his speed, willingly and without muttering imprecations on the superintendent, to such a low rate as to be able to stop short of any obstruction. We shall never get beyond the necessity of having enginemen use their own judgment as to what is a safe rate of speed; and the more complicated our train-running becomes,

the more important will it be to have enginemen's mental habits improved. As to the error of the Contich signalman, it would be astonishing, were there not on record so many American examples of the same kind. Many signalmen seem to depend on the interlocking in the same way that a car wheel depends on its flange; it is sure to go off the track if the flange fails. In America the failure of a signalman to take redoubled care when the interlocking is out of order or disconnected is usually attributed to his "greenness" or the crudeness of his training; but in an old country like Belgium we should not think of entertaining such a conjecture. The record of the Contich man would be an interesting study.

Mr. Weissenbruch's account of the discussions in the Belgian legislature is of only minor interest to Americans, so far as this particular accident is concerned; but we give it, substantially unabridged, as an illustration of how such things are done in a country where the railroads are owned by the state. Congressmen in Washington and legislators in forty-six state capitals each year voice a few thousand criticisms of the details of railroad operation, and they pass laws, now and then, which retard rather than promote true progress in safety, economy and the comfort of passengers; but we are still free from the burden of having to make sober answers to all of their fantastic and ignorant complaints, and most American railroad officers will read the account of this discussion at Brussels with a feeling of thankfulness that they are in the United States and not in Belgium. The engaging thing about legislative critics of things that they know nothing about is their versatility. They can criticize the details of work and the conduct of workmen ad infinitum, and then, when weary of that, can go to the top and dictate how the head of the administration shall conduct himself, even to the extent of formulating the rules by which he is to govern his subordinates. The mixture of old and new regulations shown to exist in this particular case undoubtedly affords an illustrative example, and the fact that the old and the new, those applicable and those out of date, are thus allowed to neutralize or weaken each other quite likely is due to their bureaucratic origin. One other point in Mr. Weissenbruch's discussion is of interest in America, that concerning the expediency of having an empty car at the rear of every train. As there have been a considerable number of rear collisions on American railroads within the last five years, in which an empty passenger car, by chance occupying the place at the rear of a train usually occupied by a loaded passenger car, was badly wrecked, it is not surprising that legislators, and some people more conservative than the average legislator, continue to look favorably on the idea of a buffer to take the shock of collisions. One European government, we believe, has recently re-enacted a rule or law that there must always be a buffer car at the head of passenger trains. Probably the question as to just which plan would preserve the largest number of lives may never be settled; but meanwhile it may be noted that, whatever may be the result of theory or of speculation on the subject, practice is rapidly deciding against buffer cars. On American roads trains with the baggage cars at the rear are more and more common, but these cars are put there for convenience, not as buffers, and the change removes a buffer car from the front end of the train, where probably it would be useful oftener than at the rear. Crowded electric cars are run on our interurban roads with no buffer either at the front or the rear; and electric trains made up wholly of passenger cars, packed full, are run every day at high speeds on a few roads.

Not the least interesting information given by Mr. Weissenbruch, in his article printed on another page, is that which appears in one of his opening paragraphs, to the effect that on the Belgian state railroads the distant signals are being supplemented by lights to make them more efficient in times of fog. We understand (though not directly from Mr. Weissenbruch) that this improvement consists in fixing two or three distinctive lights on posts—one light on each post—at short distances in the rear of the distant signal, so as to warn a careless or a poorly informed engineman that he is approaching a signal. With the posts fixed at 100 ft., 250 ft. and 450 ft. back, an engineman would thus have three warnings. Presumably, the posts are so painted as to be conspicuous landmarks in fog by day as well as by night. A post amplified into 50 ft. of white board fence, the successive fences being of different heights, is a good idea. Indeed, this arrangement was recommended some years since, we believe, by Mr. Weissenbruch himself. The systematic introduction of improved means of "finding" visual signals with the eye, would seem to indicate that the officers of the Belgian state railroads, like the great majority of conservative railroad officers elsewhere, do not look with favor on the proposal to use cab signals or automatic stops to make up for real or supposed deficiencies in visual signals.

Merchandise traffic has been picking up recently all over the country, but the movement of heavy, lower class commodities continues comparatively light. The movement of coal for domestic use in the west and northwest has been very small, despite the warning to dealers and consumers given by the fuel "famines" of the fall and winter of 1906. The grain traffic thus far has been unexpectedly light. Shipments of steam coal and lumber also have been light. It is not likely that the people of the northwest are so poor that they will not keep warm; and is quite possible that there will be a substantial revival of business; so that there is liable to be a heavy increase in the movement of coal, ore and lumber, just when the corn crop comes in to be handled. The number of surplus cars and of cars in the shops has been declining recently pretty fast, so that it is not at all improbable that within a few weeks roads in all parts of the country may have difficulty in finding cars for at least certain kinds of traffic. The Car Efficiency Committee did much good last fall, before the slump in traffic, by informing lines (which had notified the committee of prospective shortages) as to what lines had a surplus of such kinds of cars as were wanted. The committee will be prepared to furnish such information this fall to lines that ask for it. But whether there shall be a car shortage will depend much more on shippers and consignees than on railroads. The Illinois Manufacturers' Association has sent to railroad officers gratuitous advice to hurry and get their equipment ready in order to prevent a "car shortage." It looks as though the railroads were more "forehanded" in this matter than the shippers. The best thing that can be done toward preventing a car shortage in November and December, is to send as much freight as possible during September and October. It is still as true as it was two years ago that the railroads cannot satisfactorily handle in two or three months all that the country produces in a year.

SHOP EFFICIENCY.

It is probably well within the limits of fact to say that the impression is extensively held that the work done in the shops of the government and the railroads stands on a low level of efficiency. It may not be an accurate impression as applied to present day conditions, but it certainly has had a good basis in many places. Years ago the railroad was looked upon by every individual along its line as a cow to be milked dry by every hand that could reach the udder; and aside from the distribution of free transportation, the officers and men looked upon the shops as a place established for their own convenience whenever they might wish to utilize them for the purpose of doing any little odd job that might require attention. Men who should have known better, were guilty of ordering things made for their own use and behoof, that were charged to locomotive repairs though as far removed from it as one can well imagine; for example, the making of a buckboard or the clean-

ing of parlor carpets. With this attitude on the part of officers it is quite natural that the men in the shop should have fallen into a quiet, easy-going gait and that a job for a railroad should have come to be looked upon as a sinecure.

But the press of latter day service, and the sharper scrutiny to which payrolls and requisitions are subjected have changed all this, and there has been a marked rise in labor efficiency during the past decade. This has been observable all along the line, with a few notable instances that stand out as landmarks, and to which attention has been called by the results achieved. A notable instance of this kind is that of the work that has been done on the Atchison, Topeka & Santa Fe. From time to time articles descriptive of the methods and results there employed have appeared, and these have now been gathered together and published by the author, H. W. Jacobs, under the title of "Betterment Briefs." In this work Mr. Jacobs has set forth the general methods that have been employed by him in raising the standard of efficiency on the road with which he is connected. His task involved not only the introduction of the premium plan in the payment of wages, by which the workman was incited to put forth his best efforts for his own benefit, but also the enlisting of the hearty co-operation of the foremen and of the men themselves in the designing of improved tools and appliances. In this it has been necessary to have not only the approval, but the hearty assistance of the managing officers of the road.

It is to the very lack of this vital assistance that much of the inefficient work in railroad shops is due. It has been more than difficult in the past to get appropriations for shop equipment that had no productive qualities, but whose sole claim to attention lay in the fact that it would save labor. Not long ago, the *Railroad Gazette* published a description of a traveling crane, built out of scantling and charged to locomotive repairs, by a master mechanic who knew the necessities of his shop and who used this as an object lesson to convince his manager that a traveling crane, while producing nothing, could save money and would be a good investment. And so it has been throughout a long list of handy tools, and shop kinks and wrinkles, that have been conjured out of scrap material and put together with a labor charge to repairs. Expedients of this kind, born of pressing necessity, have filled American railroad shops and have furnished no end of copy to the technical papers that have taken the pains to describe them. They were, in many cases, the result of that forcing which compels a man to make bricks without straw by asking him to maintain the same output on a diminished payroll, with no extra facilities, but rather a sharp refusal to grant them when asked for. And so, in the final analysis, much of the inefficiency of the shop can be laid directly at the door of managing officers who cannot appreciate shop requirements. If then one looks into the work of any particular place, a purely cursory examination will frequently reveal any number of points where the practice might be improved, and the query naturally arises why it is that, with such a general dissemination of mechanical information as now exists, such crude and uneconomical methods are tolerated. But before making any adverse criticisms on the state of affairs it would always be well to carefully examine all of the conditions involved. Then, in nine cases out of ten, if not ninety-nine out of a hundred, it would be impossible to suggest an improvement.

It is in its suggestiveness and the statement of the results obtained that Mr. Jacobs' book is especially valuable. He cites case after case where the labor item in the performance of a given piece of work has been reduced to far less than one-half of what it was before the change was made; and this, too, not by the purchase of expensive tools, but by the adaptation of old material in the way that has made the American shop a wonder of handy contrivances.

Of course, much has been done by and is due to the introduction of the high speed steels, but this is not all. There has been, of course, a general rush towards betterment during the past decade, and the successive issues of this paper are filled with the records of the achievements. Take the one item of the turning of driving wheel tires as an example. The time required for the performance of this work on a single pair of wheels has dropped from two days to less than 40 minutes! Other examples are almost equally striking. At last the possibility of bettering shop efficiency has permeated all grades of official life and there is a general movement towards obtaining better results. In some places it is appearing as an improvement of shop facilities; in others as an improvement of the men by the systematic training of the apprentices; and a more careful scrutiny of requisitions and the cutting down of storehouse supplies are making marked savings in many places.

That any one shop has touched the highest possible maximum efficiency is doubtful, and it is probable that any railroad manager who could obtain a reliable report on what is being done on his road in every department, with a showing of what it would be possible to accomplish in the way of economies based solely on the prevention of present waste, would still find ample "food for thought" in the figures presented.

It is along such lines of suggestiveness that Mr. Jacobs' book will be found to be especially valuable, and it cannot fail to be intensely interesting to everyone responsible for the reduction of labor costs and the capital locked up in storehouse supplies.

"OVER-CAPITALIZATION," "OVER-EQUIPMENT," AND THE PANIC.

Within the past few weeks wide circulation has been given to two articles attacking the railroads, one written by C. C. Hanch, of Indianapolis, Ind., Vice-President for Indiana of the National Manufacturers' Association, the other written by R. T. Crane, of Chicago, President of the Crane Company. Both of them charge that railroads have been speculatively and incompetently managed; that they are grossly over-capitalized, and that they charge high rates in order to pay enormous dividends on watered stock. But Mr. Hanch and Mr. Crane differ widely on one important point. We present below some quotations from them in parallel columns:

MR. HANCH.

If the railroads would conduct their affairs along the lines of any well-managed manufacturing or other corporation and put a proper amount of their earnings into betterments, instead of trying to pay dividends for the purpose of giving a fictitious value in Wall Street to watered securities, there would be no necessity for increasing rates, and public animosity would not be aroused. . . . Instead of providing facilities they spent their incomes in paying large dividends on watered securities . . . or in the control of other roads rather than in the betterment of their lines. . . . The railroads have pursued the policy of the Arkansas traveler. When it rained they couldn't fix their roof, and when it didn't rain they didn't need to fix it.

MR. CRANE.

Dazzled by the pictures pointed out by the boomer, the railroad corporations have anticipated imaginary future requirements and have gone ahead extending old lines, projecting and laying new ones, ordering cars and rolling stock without any apparent thought as to whether the present or prospective needs of the country warranted the additions. . . . At the door of the boomer must be laid several colossal blunders that the railroads have made, in addition to the chief blunder of building needless miles of new track. One has been the great increase in sidings and the ordering of thousands of freight cars for which there was no necessity under proper management of the roads. . . . The claim that the country will get an immense amount of benefit from higher rates because the roads will spend the money for improvements is absurd on the face of it. The fact is that one of the chief troubles has been over-equipment. . . .

It thus appears that the railroads have bettered and extended their properties both too much and too little; that they have ruined the country by simultaneously spending too much money and not spending enough. As Mr. Crane's diagnosis is partly true, it may be worth while to examine some of the charges that he makes.

There has been within recent years a large increase in railroad capitalization. The complete statistics of the Interstate Commerce Commission for the year ended June 30, 1907, not being available we shall use those for the 10-year period from June 30, 1896, to June 30, 1906. The following table shows the increase in the capitalization of the railroads of the United States between these dates:

	June 30, 1896.	June 30, 1906.	Increase—Amount.	Increase—P.ct.
Gross capitalization.	$10,566,865,771	$14,570,421,478	$4,003,555,707	38.0
Bonds and stocks*..	1,501,346,914	2,898,480,829	1,397,133,915	93.0
Net capitalization..	9,065,518,857	11,671,940,649	2,606,421,792	28.7

*Owned by railroads.

There was an increase in gross capitalization during this period of 38 per cent., but owing to the large increase, 93 per cent., in the intercorporate ownership of stocks and bonds, the increase in net capitalization was less than 29 per cent. The increase in net capitalization, however, amounting to more than a quarter of a billion dollars a year, was, of course, a drain upon the market, and by only so much it helped to bring on the panic of last year. But the railroads, in constantly getting and investing more and more capital, were driven by the industrial demand for additional transportation.

A more important question is whether the money the railroads got for their securities was honestly and wisely spent. The following table shows some of the additions that were made to their plants:

	June 30, 1896.	June 30, 1906.	Increase—Amount.	Increase—Per cent.
Miles of line	181,154	224,363	43,209	23.9
Miles of all track	239,140	317,083	77,943	32.6
No. freight locomotives ..	20,351	29,848	9,427	46.6
No. passenger locomotives	9,943	12,249	2,306	22.0
Total loco.'s in service...	35,950	51,672	15,722	43.0
No. of freight cars.....	1,221,887	1,837,914	616,027	50.0
No. passenger cars	33,003	42,262	9,259	28.0
Total cars in service....	1,297,649	1,958,912	661,263	51.0

Consolidation of the figures of capitalization and of mileage in the two foregoing tables will show that gross capitalization per mile of line increased from $59,610 to $67,926, or 14 per cent., that net capitalization per mile of line increased from $50,043 to $52,062 per mile, or 4 per cent., and that net capitalization per mile of all tracks decreased from $37,900 to $36,700, or 3.3 per cent. Meantime, mileage of line increased 24 per cent., mileage of all tracks 33 per cent., total number of locomotives in service 43 per cent., and total number of cars in service 51 per cent. The physical condition of the roads also was vastly improved, both by the purchase of larger and more costly cars and locomotives than those scrapped, and by the expenditure of many millions of dollars for double tracking, reduction of grades and straightening of lines, for putting in heavier permanent structures and bridges, heavier rails, ballasting, etc. Much more than the money raised by the sale of securities went into the properties. According to the statistics of the Interstate Commerce Commission, during these ten years, permanent improvements costing more than a quarter of a billion dollars were charged to income account. The amount thus charged off was eight times as great in the eight years ending in 1906 as in the previous eight years. There was some stock watering, but absorption of water went on much faster.

But Mr. Crane says that under good management such enormous expenditures would not have been needed—that the roads "anticipated imaginary future requirements." The following table shows that their anticipations were wise:

	Year ending June 30, 1896.	Year ending June 30, 1906.	Increase, per cent.
Tons freight moved 1 mile.	95,328,260,378	215,877,551,241	126
Freight-train miles	479,500,170	594,005,825	24
Tons freight per locomotive	199	344	73
Pass'gers carried 1 mile.	13,049,007,233	25,167,240,831	92
Passenger-train mileage...	332,854,218	479,037,553	44

Present conditions are abnormal and temporary. When business revives there may, for a time, be enough facilities of transportation to meet the demand. But if the commerce of the country begins to grow again, as it grew from late in 1896 to late in 1907, the railroads will have to resort once more to the money market for enormous sums with which to buy cars and engines and make permanent improvements, and they, as well as shippers and consignees, will have to co-operate vigorously to improve operating methods, and especially to relieve the congestion of traffic in railroad yards and on private tracks leading to stores and warehouses at large terminals. Otherwise there will be chronic repetitions of car shortages, such as cost railroads, shippers and public so much in the fall and winter of 1906.

THE LABOR QUESTION ON THE RAILROADS.

In principle and essence the labor basis on our railroads is the same as elsewhere. A corporation, or a man representing the corporation, seeks the service of another man. The other man from various motives is willing to do the service and the contract is made. This is the basic and mutual principle on the railroad from President down to errand boy. But when, as contrasted with this root idea, we come to the form of railroad labor there are some special variants as compared with most other great industries. Its groups of workers are large and cover a great range of tasks. They are almost exclusively masculine except in a small corner of office work. They are mobile and the runs of enginemen, firemen, trainmen may be shifted often and are apt to be shifted; and, lastly, from highest to lowest the railroad force stands in an acute relation to the public—more so than probably any other class except, may be, small classes like policemen. Those relations involve public convenience, necessity, courtesy, and above all, safety; and they apply though in somewhat differing degrees, to both the passenger and the freight service. And, in almost exact proportion, as populations thicken, civilization deepens and the railroad grows old do those relations become acute. The frontier community accepts thankfully the railroad infirmities which the elder community scores.

The immense growth of the street railway systems of the country since electricity supplanted the horse has indirectly, no doubt, added not only to the critical relation of the public to the steam road but to every public service corporation. It is so, of course, where the steam road owns the trolley but it reaches beyond that. The average passenger on the trolley is apt to be a daily passenger—a kind of commuter though not made so by the commuter's reduced rate and with a commuter's habit of criticism. The occasional passenger on the steam road who will tolerate a belated train or old-fashioned car becomes severely censorious toward the trolley service which he touches every day. He notices the car that runs by him at the corner, the car overcrowded at his hours of meals and the trolley conductor who, unlike Lot's wife, never looks back. It would be interesting if one could reduce to comparative figures the sentimental influence of the electric roads on the responsibility to which the traveling public hold the carrying companies in general. But it is there and "labor" is mainly the go-between that interprets it to the public. It was on such a condition in which the quality and efficiency of the labor of the railroads had become in its public bearings—as well as others—of increased importance that our business depression, beginning last autumn, fell.

It fell also on a period of extended and intense labor organization. Theoretically, by the reasoning of the adversity which is the tie that binds, hard times ought to stimulate the labor unions. In practice we know they do just the reverse, weakening the unions by the dropping of dues and membership and creating the big group of the unemployed. The industrial depression which hit our railroads and hit them hard at a time when their employees were organized as never before and also receiving the highest wages in our railroad history, has been attended thus far with unique results. Logically there should have been a level reduction of wages followed later, probably, by some reduction of the labor force. Actually there has been a large reduction of force with little or no reduction of the wage rate. The railroads have, however, profited, and profited much by the increased

efficiency of the men who hold their jobs. From the union viewpoint the outcome is at once pathetic and grotesque. In order that the union wage be maintained for the union men employed a great many union men must be thrown out of work—and the unions themselves, in case of a strike, face the peril from their own unemployed. Added to the economic paradoxes of the situation are the strange persistence of the high cost of living which gives strength to the argument against reduced wages—not only on the railroads but everywhere else—just as it sanctioned the earlier rise of the rate of wages; and, finally, the civic interferences with those processes of recuperation by which the railroads might otherwise meet the present strain.

We are but describing a strange situation against which prophecy is mere guess work. It will be solved, of course, if the hard times soon recede, if the railroads revert to their prosperity of a year ago, if the plus sign before earnings replaces the dismal and iterative symbol of minus and the host of the railroad unemployed return at present and unreduced wages. But suppose the pointer remains fixed or nearly so or, worse, swings downward and the rates, as offset to unreduced wages remain unchanged or practically do! What just plea can then be heard against the argument that railroad labor should share with railroad capital the burden of loss? What intelligent and fair-minded citizen can then urge that the railroad should be debarred the remedy open to every branch of private industry and to the individual employer? And will the unions then persist in vain resistance to the higher law of self-preservation on the part of the railroad capital on whose life their own life depends? In the untoward event, not likely yet not impossible, we look for no such follies but rather for labor's recognition of the natural statute unwritten by lawmakers which dominates every industrial case. Public opinion, stimulated overmuch to a spirit of criticism of the railroads, will have opportunity to modify itself. Meanwhile the economists will also have opportunity to watch and study the phenomena of a period of industrial and financial strain which, in many of its phases, is most perplexing and which has the railroads at its center.

The study of the amount of traffic per unit of labor in this journal of Aug. 21 last, permits some deductions. The table shows that in one year, 1907, one man, with the aid of modern railroad appliances, was able to move one ton of freight 139,960 miles, and one passenger 16,397 miles. A man with a good team of two horses and a wagon on roads better than the average American road, would be doing well to haul 1½ tons 30 miles, six days in the week, or 13,500 ton miles per year, leaving no time for passenger transportation. At this rate it would require more than 10 men and 20 horses to do the freight transportation which one man does with a railroad and without any horses; and to carry the freight traffic which the railroads of this country carried last year, 17,500,000 men and 35,000,000 horses would be required, instead of the 1,672,000 men who actually not only effected the transportation of all this freight, but of all the passenger traffic also. The improvements since 1889 alone have enabled 1,672,000 men to do what in 1889 would have required 700,000 more.

NEW PUBLICATIONS.

Reinforced Concrete. By Ernest McCullough. Chicago: Clement Era Publishing Co. 128 pages; 5 in. x 8 in.; 28 illustrations. Price, cloth, $1.00.

This book differs essentially from most of the others treating this subject in that it is a manual of practice, and deals with the practical problems encountered in the building of reinforced concrete structures. These problems include not only the selection and manipulation of the materials, but the relations of labor to the results and the reasons for the disposition of the steel. The theoretical part of the subject is by no means neglected, but no attempt is made to demonstrate the truth of the formulæ given or to establish the principles upon which they are based. They are stated clearly and concisely, and put in such a way that they are ready for use by the man who wants them, without the incumbrance of anything but the simplest of mathematics. In this respect it is a good handbook for field work. While these points are valuable, it is in its treatment of the practical problems and in the suggestions that it contains that the chief merit of the work lies; and all through there are suggestions and reasons which are too frequently omitted in works of a more theoretical character. For example, in discussing the adhesion of the concrete to the steel the inference might often be readily drawn that it partakes of the nature of a glue or paste, whereas, in reality, it is due entirely to the fact that "in setting concrete shrinks and consequently it grips fast all steel or anything else of an impervious nature that is enclosed within its mass. This gripping action is entirely physical and not chemical." Again, the author disposes of the idea set forth by Mr. Considere to the effect that, when combined with steel the concrete undergoes some sort of mysterious transformation by which it ceases to act as ordinary concrete, by quoting Prof. Turneaure's experiments demonstrating that when stressed beyond its elastic limit the concrete breaks into innumerable fine cracks that can only be detected with difficulty.

The author evidently puts more confidence in the value of the steel reinforcing in tension than in compression, and insists that when used in the latter way the ends should be milled so as to have a smooth bearing on the base, while in tension the successive bars should be fastened together and not merely overlapped with a dependence upon the concrete and its adhesion to transmit the strains.

In treating of erection, the labor problem is dealt with somewhat extensively. The author advocates a high grade of of workmen even in the laborers. He holds that the reason why facts as to the cost of reinforced concrete work are so difficult to obtain is largely because of poorly developed labor conditions, and thinks that skill in the workman is an important item. "While unskilled labor can be, and is largely, employed, there is a vast difference between the unskilled man who is born and reared in America, who can understand English, and the unskilled foreigner who has to be addressed in a sign language. Unskilled laborers are divided into two classes, the intelligent and the unintelligent. The intelligent ones are the kind to employ in reinforced concrete work, for the various operations are rapidly assuming the importance of trades."

And so through all of the processes of selection of material, the mixing, wetting, pouring, erection and removal of forms, placing and holding the steel, quality of steel, and the hundred and one details of the work, there are innumerable practical suggestions that cannot fail to be of interest and value to every worker in this new material, whether it be in the office at a drawing board, or in the field in the execution of designs or in constructing without previous design; and these suggestions will at once appeal to the practical man as being based upon common sense and the condition of things.

Proceedings of the Ninth Annual Convention of the American Railway Engineering and Maintenance of Way Association. E. H. Fritch, Secretary, Chicago. Published under the direction of the Committee on Publications. 6 in. x 9 in.; 911 pages. Paper, $2.50; cloth, $3; half-morocco, $3.50.

The growing value and importance of the work of this association is well indicated in the rapid increase in the size of its Proceedings. This year's volume is larger by 181 pages—40 per cent.—than last year. This is due in large part to the considerable number of valuable appendices which accompany several of the reports. The Signaling report, for example, has some especially good appendices, and other reports whose value is similarly enhanced are those on Water Service, Iron and Steel Structures, Yards and Terminals, Ties and Economics of Railway Location. Among the Water Service appendices is a

paper on the electrical treatment of water for the reduction of scale-forming ingredients. A portrait and memoir of the late President of the association, Walter G. Berg, who died on May 12, 1908, follows the condensed account of the business session of the association, with which the volume opens. The organization of the committees for 1908-09, with the instructions from the Board of Direction concerning their work, is given in an appendix.

Steel Car Design. By A. Stucki. Reprinted from the *Railroad Gazette.* Pittsburg: Published by the author. 23 pages; 7 in. x 10 in.; 19 illustrations. Cloth.

Readers of the *Railroad Gazette* will remember this book as having appeared as a series of articles in 1904, in which a mathematical consideration was given to the stresses developing in railroad cars in service, especially those of a high capacity. The details covered are the axles, arch bars, truck bolsters, distortion of trucks on curves, the springs, brakes, bolsters, sills, sides, and gondolas in which a portion of the load is carried by the sides.

Letters to the Editor.

RULE 94.

San Francisco, August 20, 1908.

To the Editor of the Railroad Age Gazette:

I have read the replies of Messrs. Dalby and Mackie regarding the second paragraph of Rule 94. I endeavored to place the same construction on this rule that the majority of trainmen would place upon it. Railroad men of to-day, who are in the service, must act when the emergency arises without having a Mackie on the train to interpret the rule, or a despatcher to confer with. For the information of Messrs. Dalby and Mackie, the Train Rules Committee of the association and readers, I will say that the condition as outlined in my communication in your issue of June 26 actually existed; and the entire crews of the four trains in question (20 men) applied the second paragraph of Rule 94 as interpreted in my communication.

I put myself in the position of the practical railroad men—not that of the men in the office; the men on the road, who must apply a rule from a practical point of view, not those who sit in the office and split hairs over its literal meaning.

When we stop and consider for a moment that some of the best men in train service, or in despatching offices, are not highly educated, and are not phonographs and able to repeat all the rules of the book; and that a condition such as I described does not materialize every day in the week, or even once a year, could we condemn them for applying the rule from a practical standpoint? Now, if you do not wish them to apply the rule from common practical reasoning, why not state the rule in language that will indicate plainly that they *must* not move under the rule unless the overtaking train has right or schedule permitting it to move against *all trains?*

The second paragraph of Rule 94 reads, in part: "When a train, unable to proceed against the right or schedule of an opposing train, is overtaken between telegraph stations by an inferior train or a train of the same class having right or schedule which permits it to proceed. . . ." Permits it to proceed against what? What is the first thought and understanding of the practical trainman in the wee small hours of the night; tired, hungry and weary? Why, the overtaking train has right or schedule, as the case may be, which permits it to proceed against the train for which he is tied up; and as he himself already has right or schedule permitting him to proceed against all others, what more does he want?

The conductor of the overtaken train has no time to hunt up a common school grammar, or an expert on rules, to confer with; but simply applies what he considers "horse sense" in case of an emergency, and considers his own train and proceeds. The other two crews are doing the same thing six miles away.

That condition has existed perhaps only once, but it was once too often. Do not be surprised if it happens again and at any time. The same condition could exist if all were regular trains. One correspondent says: "You may be able to proceed against a dozen trains, but if you have an order to meet one extra, you do not come under the title of right or schedule, which permits it to proceed." Again I ask—permits it to proceed against what? Against the only train for which he is tied up, or against all trains? He also states that the train must have something before it can give it away, which is quite right. All the overtaking train has to give away, that is of any value, is its authority for the overtaken train to move against the train for which it is being detained. Why do they want any more, when they hold authority against all others in their own right to move against them? Is it possible to obtain the very thing you already possess?

Those who place such a fine interpretation on the rule have one advantage—they do not have to do the jumping. But after the other fellow jumps, they will be able to pull themselves up by their boot straps before they can convince the level-headed general manager that the rule is a good one as it now exists. WM. NICHOLS.

The discussion of Rule 94 has been of rather doubtful profit and we had resolved to end it; but we admit Mr. Nichols' letter because it is a forcible statement of actual difficulties. —Editor.

"LESSONS TO THE PEOPLE."

To the Editor of the Railroad Age Gazette:

I note with much interest the item in your paper entitled "Discourtesy of Ticket Sellers." It is surprising how incompetent and indifferent a great majority of the ordinary ticket sellers are particularly in the Southwest. Were the railroad presidents compelled to ride on regular trains and do business with their employees, as it is the lot of the traveling public to do, much of the unfavorable granger and radical legislation would be headed off. The new fad of sending out "Lessons to the People" from villas in the Adirondacks or Southern California may be a pleasant and convenient method to those who employ it, but it is very unpopular with the traveling public. ARKANSAS TRAVELER.

A POLITE TICKET SELLER.

New York, September 4, 1908.

To the Editor of the Railroad Age Gazette:

A word to L. L. M., who writes of "The Discourtesy of Ticket Sellers."

One evening at the Grand Central Station I received my ticket and sleeping car accommodations in such an exceptionally kind and agreeable manner that I felt that more than the mere formal "thank you" was necessary, and I added a word or two more. In response to this the ticket seller said: "If you could only know sir, how we are spoken to and addressed and insulted by passengers, you would not wonder that now and then we are not good natured." With rare exceptions my experience has been of this kind. Evidently L. L. M.'s idea of seasoning includes more vinegar than sugar. Let him try sugar for a change. J. J. M.

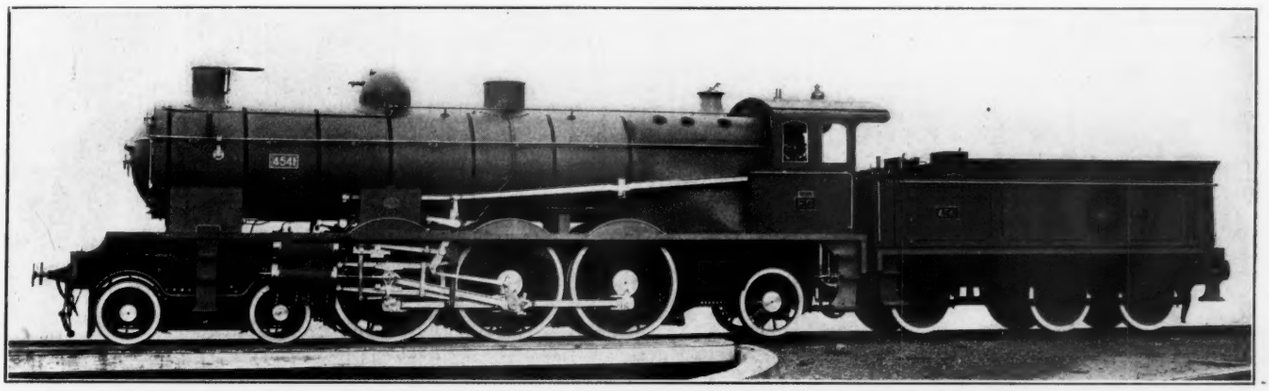
We are glad to print this commendation of the ticket seller; and at the same time desire to call attention to his reply. It was made on the spur of the moment and is not to be taken as indicating with precision the man's habitual attitude. But we have heard of agents who offered that kind of explanation to the superintendent. It is all right for passengers, but within the family the rule is, *Don't.* The superintendent is bound to "wonder" at ill-nature in the ticket office, howsoever insulting the passenger may be.—Editor.

DE GLEHN 4-CYLINDER COMPOUND PACIFIC TYPE LOCOMOTIVES FOR THE PARIS-ORLEANS RAILWAY.

The Schenectady Works of the American Locomotive Co. has recently completed an order of 30 Pacific type locomotives for the Paris-Orleans Railway of France. These engines were built strictly in accordance with specifications and drawings furnished by the railway company, all the dimensions being given in the metric system, which the workmen used direct. These engines are intended for fast express service on the division between Limoges and Brive, 61.27 miles, where the grades are long and heavy in both directions. From Brive, there is, with the exception of a few short level stretches, an almost continuous up grade averaging about .75 per cent. for 29.5 miles, while in the other direction, the road from Limoges to the summit of the rise is more undulating and the grades steeper, but shorter, the steepest grade being about .95 per cent. and 7.14 miles long. The fastest trains weigh from 300 to 325 metric tons and make the run between Limoges and Brive in one hour and 29 min., including 16 stops, while from Brive to Limoges, with the some weight of train, the time is 8 min. longer. To meet these requirements a powerful engine with a large boiler capacity for high speed is needed. The engines here illustrated are designed to haul trains of 400 metric tons on a 1 per cent. grade at a speed of 30 miles per hour.

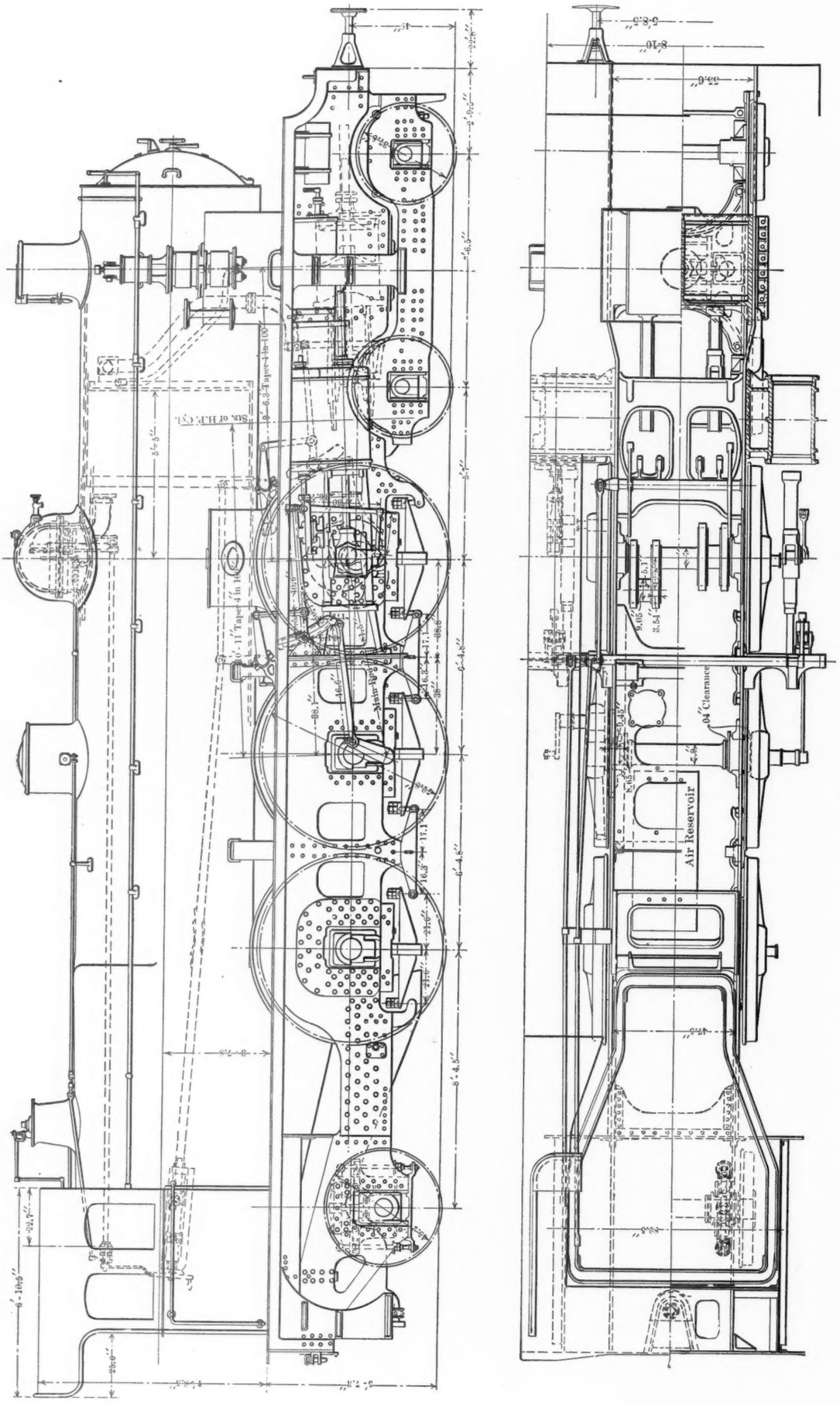
These locomotives are of the 4-cylinder, balanced compound type, the cylinders being compounded and arranged on the De Glehn system. A departure from the usual practice in the De Glehn type of locomotive will be noticed, in that the high pressure cylinders have piston valves, and the steam pipes leading to them are located in the smokebox instead of being outside the boiler. The low pressure cylinders are between the frames underneath the smokebox and drive on the cranked axle of the leading driving wheels; while the high pressure cylinders, outside of the frames and some distance back of the low pressure cylinders, are connected to the middle pair of driving wheels. The two low pressure cylinders, together with their steam chests and a receiver, are formed in one casting. The low pressure bronze valves are of the plain slide type, unbalanced and have inclined seats. In order to provide clearance for the leading truck, all the cylinders are slightly inclined. The two sets of valves are operated by independent valve gears of the Walschaerts type. The gears for the outside cylinders are driven by return cranks forged solid with the crank pins of the middle pair of driving wheels, while the inside gears are driven from eccentrics on the leading axle. As the centers of the high pressure valve chambers are 125 millimeters (4.92 in.) outside of the cylinders, all the parts of the high pressure valve motion are in the same vertical plane; so that the motion of the eccentric crank is transmitted direct to the valve without the use of rocker arms. With the inside valve gears, however, the eccentric being located on the first axle between the inside crank cheeks, the centers of the eccentrics are 350 millimeters (13.78 in.) inside of the valve centers. In order to transmit the motion from one plane to the other, therefore, the inside trunnions of the links are extended and provided with downward extending arms, to which the eccentric rods are connected. This arrangement, of course, introduces a horizontal leverage which tends to spring the valve motion, which is counteracted, as far as possible, by supporting the links at three points. The reverse shafts for the outside and inside gears are operated by a twin screw reversing mechanism, which is so arranged that the two shafts may be operated separately or together, thus permitting independent varying of the cut-offs in the high and low pressure cylinders.

The steam pipes to the high-pressure cylinders are seamless drawn steel tubes, their connection to the cylinders being shown in the side elevation. Steam from the high-pressure cylinder exhausts into intercepting valves, located in chambers cast on the side of each low-pressure cylinder, directly beneath the steam chests. These valves are in the form of hollow cylinders and have suitable openings cut in them, which, according to the position of the valve, allow the high-pressure exhaust to pass to the low-pressure steam chests and receiver, or to the atmosphere, through a direct exhaust passage cored out in the front of the low-pressure cylinder casting. These valves are operated by air pressure, controlled from the cab, the air cylinder being located between the frames just ahead of the low-pressure cylinders, and the ends of the piston rod being connected to crank arms on the rods of the intercepting valve stems. Steam direct from the dome is admitted to the low-pressure steam chests, and receiver in starting or when working simple, by a valve located on the backhead of the boiler, which allows steam to flow through a small copper pipe, extending from it through the front tubesheet and connecting to the copper pipe, shown in the side elevation, which connects to an opening in the receiver on the right of the exhaust pipe. Another copper pipe connected to a similar extends out through the side of the smokebox and is provided opening in the receiver on the left side of the exhaust pipe extends out through the side of the smoke-box and is provided with a relief valve which regulates the pressure of steam in the receiver.



De Glehn Compound Pacific Locomotive; Paris-Orleans Railway.

The frames are steel plate in two sections, the main frames being 32 millimeters (1.26 in.) thick, and the rear section for the trailing truck being 30 millimeters (1.18 in.) thick. A good depth of plate is provided over the pedestals. The frames are offset at the front end in order to provide room between them for the low-pressure cylinders. They are very strongly braced together, the location and arrangement of the bracing being shown in the elevation and cross sections. The low-pressure guides and also the low pressure link supports are bolted to the heavy steel box casting between the high pressure cylinders. The outside guides and high pressure link supports are bolted to cast steel guide yokes secured to the frames. All the axles are forged steel, the crank axle being a



De Glehn Compound Pacific Locomotive for the Paris-Orleans Railway; Built by the American Locomotive Company.

single forging. The driving boxes are of forged steel. The three pairs of driving wheels are equalized together the underhung spring system being employed.

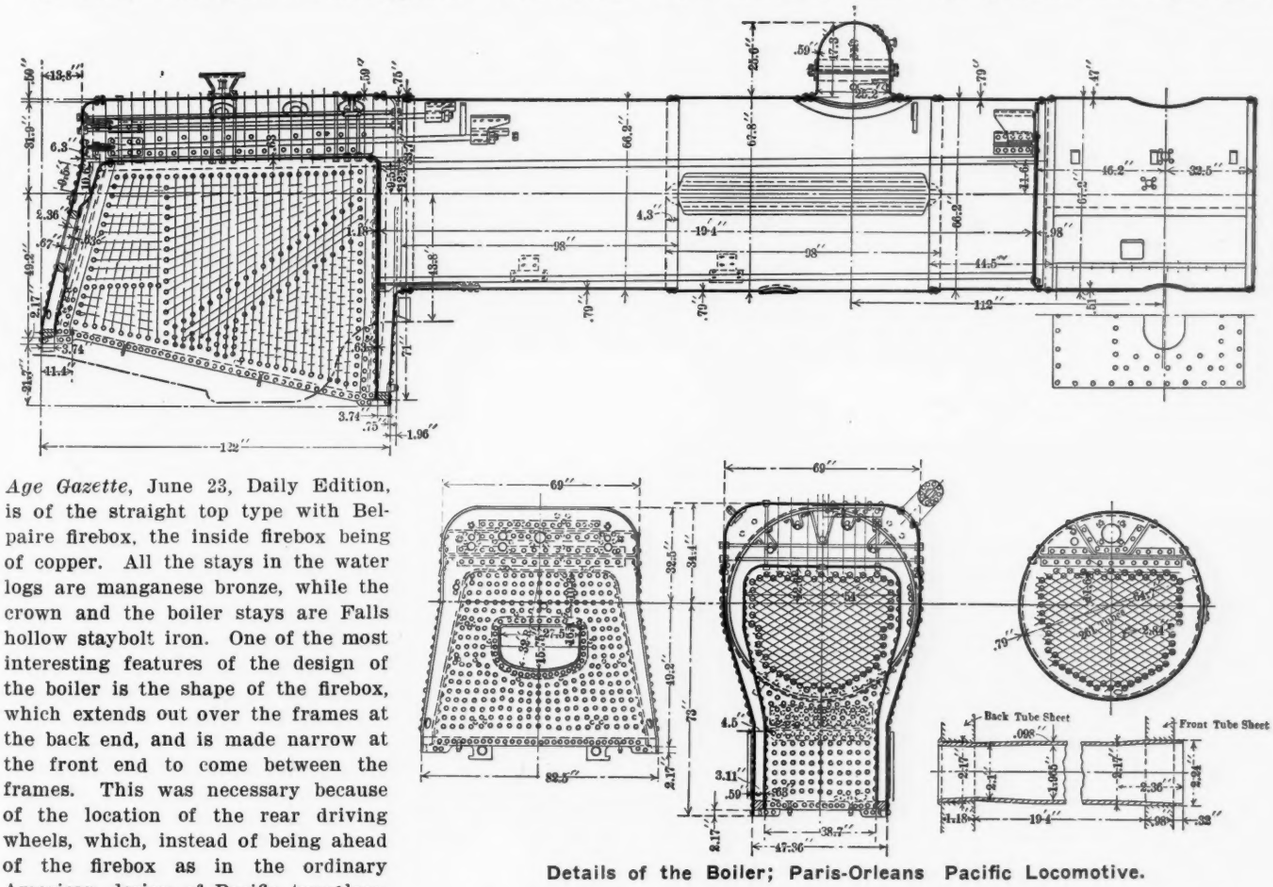
Contrary to American practice in this type of engine, however, the trailing truck is not equalized with the driving wheels. The trailing truck is of the side motion type with inside bearings; lateral motion is provided by 90 millimeters (3.54 in.) play between the boxes and pedestals on each side, and the load on the truck is utilized to bring the truck back to its central position. The engine truck is the Paris-Orleans standard design of four wheel truck, all the weight being transferred to it by two hemispherical side bearings seated in castings which slide on the cast steel center frame. The truck is brought back to its central position after leaving a curve by two transverse coil springs, one on either side of the center plate.

The boiler, a description of which appeared in the *Railroad Age Gazette*, June 23, Daily Edition, is of the straight top type with Belpaire firebox, the inside firebox being of copper. All the stays in the water logs are manganese bronze, while the crown and the boiler stays are Falls hollow staybolt iron. One of the most interesting features of the design of the boiler is the shape of the firebox, which extends out over the frames at the back end, and is made narrow at the front end to come between the frames. This was necessary because of the location of the rear driving wheels, which, instead of being ahead of the firebox as in the ordinary American design of Pacific type locomotive, are so located, that they extend back of the front end of the firebox. The barrel of the boiler has an outside diameter at the front end of 1.68 meters (about 66⅛ in.). It contains 261 tubes, 55 millimeters (2.165 in.) in diameter and 5.955 meters (19.54 ft.) long. The total heating surface of the boiler is 3,048 sq. ft., of which the tubes contribute 2863.5 sq. ft. The grate area is 45.7 sq. ft.

The smokebox has a high exhaust pipe fitted with a variable exhaust device. This device consists of a hollow cone fitted in the top of the exhaust nozzle. The largest outside diameter being equal to the inside diameter of the tip of the exhaust nozzle. This cone is connected to the horizontal arm of a shaft which extends out of the side of the smokebox which is operated from the cab by a screw and hand wheel. By lowering or raising this cone, the amount of the exhaust opening is altered. The blower bronze nozzle is a hollow ring surrounding the exhaust nozzle provided with a number of holes in its upper face. A sprinkling device is placed in the smokebox for extinguishing hot cinders. The smoke-stack is cast iron, with a hood for checking the draft when the engine is standing or drifting.

The tender tank is of the water bottom type with a capacity of 20,000 litres (5,281 gal.). It is provided with three gage cocks. The tender frame consists of two steel plate side frames, placed outside of the wheels and strongly braced together. The tender is carried on six wheels, the weight being transmitted to the journal boxes through semi-elliptic springs over the top of each box, the two rear pairs of wheels being equalized together.

These engines have Westinghouse high speed brake equipment on all drivers, engine truck and tender wheels; two Friedmann non-inspirating injectors; Gresham and Craven pneumatic sander; a speed indicator of the Hausshalter type; Westinghouse friction draft gear on the rear of tender, and steam heating equipment. Spring buffers and railguards are provided at the front of the engine and at the rear of the tender, and a screw coupling is furnished at the front of the engine.



Details of the Boiler; Paris-Orleans Pacific Locomotive.

There are a number of other features in the details of these engines, in addition to the general characteristics already noticed to which attention should be directed. In the case of the boiler, it will be seen that the use of the flexible staybolt, where the inside sheets are of copper, has been considered unnecessary, while, on American engines, where both sheets are of steel, it has been found to be desirable to use them in constantly increasing numbers, until, in some instances, all of the bolts in the flat surfaces are of the flexible type. Copper also entails a closer spacing of the bolts and, in this boiler, they will be found to range from 3.15 in. to 3.30 in. between centers, as compared with a third greater distance in steel sheets. The firebox, too, is long at the grate, this dimension being nearly 9 ft. 4 in.; though, due to the slope of the back head, the length at the top is but 8 ft. 2 in. In the foundation ring

there are a number of bronze plugs, like those shown in the detail. The staying of the back head also differs from the usual American practice. The usual method in the United States consists in the use of a piece riveted to the back head and a crowfoot brace similarly fastened to the roof-sheets, or, in some instances, carried forward to the rear course of the shell. In this boiler the stays are run through and bolted to the back head, and are held by nuts at the front end to brackets riveted to the sheets. The advantage of this method of staying lies in the possibility of drawing each stay up to the full bearing or tension that is desired regardless of any inaccuracy of workmanship which sometimes leaves the riveted crowfoot stay slack until brought under tension by the yielding of the parts, to which it is attached, to the pressure in the boiler.

The dome is of the form commonly used in European practice, where the cover is hemispherical and forms the upper half of the dome and can be readily removed, thus giving an easy access to the throttle and dry pipe. This design also makes it possible to effect a saving in weight, as compared with the heavy ring frequently used at top of American domes. We miss, however, the small hole in the boiler shell and the heavy stiffening ring and dome ring common in the United States.

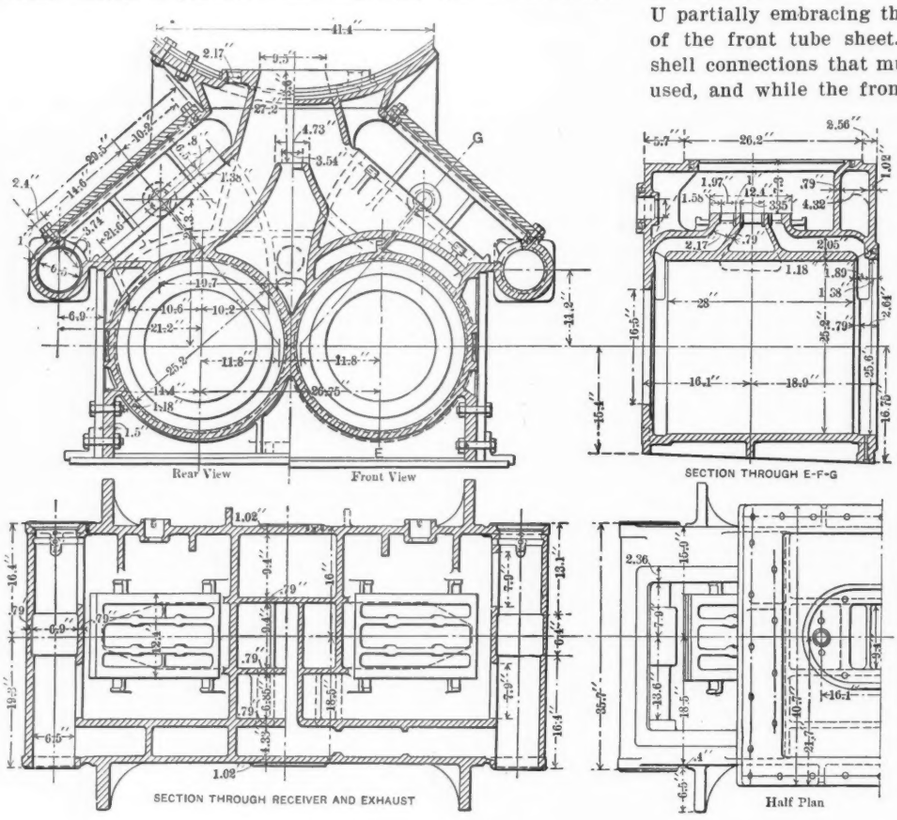
As in the case of the back head, there is difference in the staying of the flat surface of the front tube-sheet as compared with American practice. In this instance there are two pressed steel angles, placed back to back with a long leg, 13.78 in. deep, riveted across the sheet just beneath the dry pipe opening, with the ends turned up and riveted to the shell. Another deep angle is also set as a U partially embracing the opening, as shown in the elevation of the front tube sheet. This method does away with the shell connections that must exist where the crowfoot brace is used, and while the front tube sheet is rigid in itself it can yield, to an extent, to accommodate the natural expansions of the tubes.

The firedoor has the shape of an inverted arch, and is formed by a solid ring riveted between the plates. This form has the advantage of presenting nearly the same opening as a square door, and yet the rounded bottom facilitates the rise of the steam that is generated in the lower portion of the back leg beneath it.

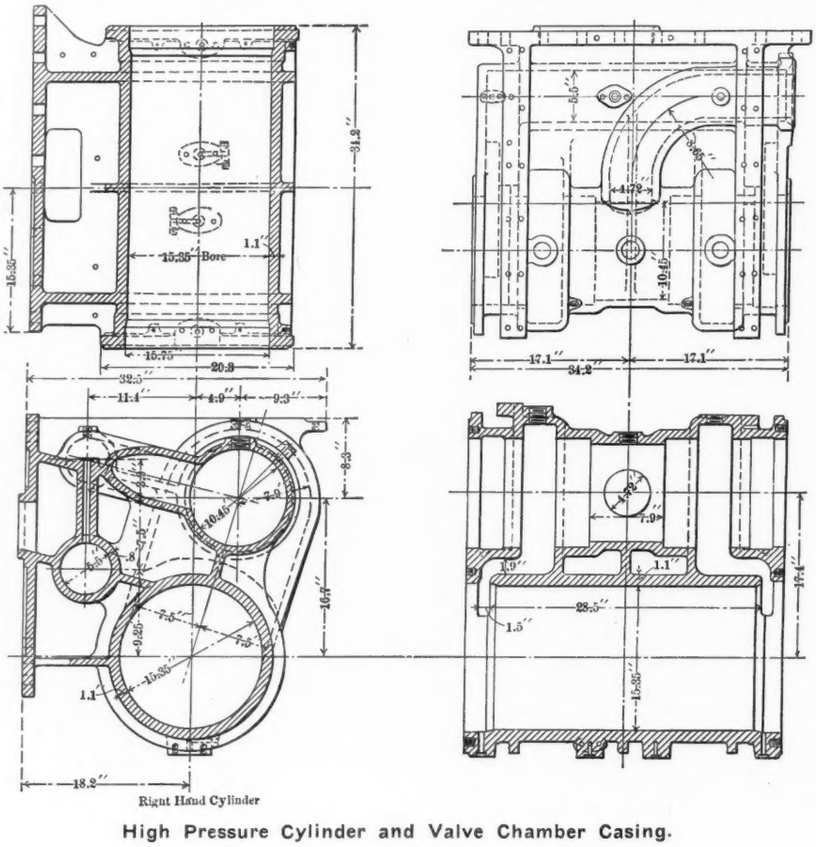
The throttle valve is of the usual sliding type moving over a vertical face and operated by a crank handle in the cab.

The reversing gear is duplicated in that it has two reach rods for moving the gears of the high and low-pressure cylinders independently of each other, so that the cut-off for each can be set at a point to produce the best results. The low-pressure rod takes hold of an idle rocker on the high-pressure lifting shaft and thence operates the low-pressure lifting shaft through an ordinary connection.

In the spring suspension and equalization of the driving wheels,



Low Pressure Cylinders.



High Pressure Cylinder and Valve Chamber Casing.

they are all fitted with underhung springs of the same dimensions. But the distribution of the weight of the engine at the frames is such as to necessitate the use of equalizing beams having arms of unequal length in order to secure an equal distribution at the ends of the springs. Finally the steam pipes are led towards the front, in the smokebox, to the back of the low-pressure cylinder casting, and thence back to the front of the high-pressure cylinders, as shown on the side elevation of the engine and the details of the cylinder casting.

The following are some of the principal dimensions of these engines:

Cylinder, diameter, h. p.	11.81 in.
Cylinder, diameter, l. p.	25.20 "
Piston stroke	25.79 "
Track gage	4 ft. 9.1 "
Wheel base, driving	12 ft.
" " total	34 "
" " engine and tender	58 ft. $5^{11}/_{16}$ in.
Weight on drivers	122,000 lbs.
" total	195,000 "
" engine and tender	294,800 "
Heating surface, tubes	2,863.5 sq. ft.
" " firebox	184.7 "
" " total	3,048.2 "
Grate area	45.7 "
Journals, driving axle	8.66 in. x 9.45 in.
" front truck	5.91 " x 9.84 "
" trailing truck	7.09 " x 11.81 "
" tender	5.51 " x 9.84 "
Steam pressure	225 lbs.
Fuel	Coal
Firebox, length	9 ft. 3.89 in.
" width	6 " 2.02 "
" thickness crown, sides and back	.63 "
" thickness tubesheet	1.18 "
" water space, front and back	3.74 "
" water space, sides	3.11 "
Tubes, material	Smooth soft steel
" thickness	.10 in.
" diameter	2.17 "
" length	19 ft. 6.15 "
" number	261
Smokestack, diameter	19.68 in.
Tender, material	Steel
Tender, capacity water	5,283.5 gals.
Valves, travel, h. p.	5.26 in.
" travel, l. p.	5.67 "
" lap, h. p.	1.06 "
" lap, l. p.	1.06 "
" exhaust lap, h. p.	0.12 "
" exhaust lap, l. p.	0.20 "
Wheels, diameter, driving	6 ft. 0.84 "
" " front truck	3 " 1.80 "
" " trailing truck	3 " 9.28 "
" " tender	4 " 1.0 "
Tractive effort	24,940 lbs.

$$\frac{\text{Weight on drivers}}{\text{Tractive effort}} = 4.89$$

$$\frac{\text{Total weight}}{\text{Tractive effort}} = 7.82$$

$$\frac{\text{Tractive effort x diameter of drivers}}{\text{Heating surface}} = 595.9$$

$$\frac{\text{Heating surface}}{\text{Grate area}} = 66.7$$

$$\frac{\text{Firebox heating surface}}{\text{Total heating surface}} = 6.06^*$$

$$\frac{\text{Weight on drivers}}{\text{Total heating surface}} = 40.02$$

$$\frac{\text{Total weight}}{\text{Total heating surface}} = 63.97$$

$$\frac{\text{Weight on drivers}}{\text{Total weight}} = .625$$

$$\text{Displacement 2 h. p. cylinders, cu. ft.} = 3.27$$

$$\frac{\text{Total heating surface}}{\text{Displacement, 2 cylinders}} = 932.17$$

$$\frac{\text{Grate area}}{\text{Displacement, 2 cylinders}} = 13.97$$

*Per cent.

On the 14th of July last (1st old style) a new passenger tariff went into effect on the Russian railroads. Third-class fares are increased 10 per cent.; second-class fares become 1¾ times, and first-class three times the third-class fares. A fourth-class fare is introduced, which is one half the third-class, and emigration rates are made the same as third-class children's fares. There is no change in suburban fares.

PICKED UP ON THE ROAD.

BY GULF.

A good deal has been printed regarding the advantages accruing from the change from the *table d'hôte* to the *à la carte* method of conducting the dining car service. There are undoubted advantages, but it is doubtful if many of them are on the side of the public, except in so far as the person who merely wants a bite and no more, can get it for less, a little less, than a dollar. The way it looks to the lay traveler is about like this: When the dining car was introduced it was placed on the basis of a luxury advertised to attract travel, and its expenses charged to the advertising account just as electric lights, or any other attraction that is not a necessity. It was not expected that the service would pay expenses, and it didn't. So the superintendent or chief steward or caterer, or whatever he may have been called, simply set out to make an attractive service, something that people would talk about and something that the general passenger agent could brag about truthfully in his advertisements. The result was that the passenger got more for his dollar in the way of a meal than he ever did before, or ever will again, and the railroad company lost money on the deal. This was all very well so long as the dining car was a rarity and the lunch counter the rule. But when the dining car was to be found on every road and on every train the case resembled that of Mrs. Campbell, who remarks in one of her plays: "There's no credit in being married in a society where everybody is married." So the advertising value of the dining car having vanished, its necessity having been established and its abolishment having become impossible, the railroads naturally looked for some means of turning it into a profit instead of a loss. That means appeared in the *à la carte* method of service. And then, the profit having been secured in some cases, the superintendent who wants to make good tries to make the profit as big as he can. And in this the public loses. There is no use denying that the old *table d'hôte* service was of an unusually high character. The linen was fine and immaculate in its whiteness, and many a housewife envied the attractiveness of the table that she could not parallel at home. As a general thing the white linen and the beautiful table furnishing have been retained, but in other respects there has been deterioration in everything except the prices.

CALAIS-DOVER CAR FERRY.

M. J. Legrand has presented a paper of some length to the French Society of Civil Engineers (published in the *Bulletin* for June), in which he reviews the work that has been done by the several large car ferries of the world, particularly those of the United States. He discusses the manner of operating such ferries and explains the principal difficulties that are to be overcome, and then argues for the adoption of the system for the transportation of cars and their lading between Calais and Dover. He concludes that the technical questions involved in the construction and operation of car ferry boats on such a run as that indicated have been met elsewhere with sufficient success to warrant the conclusion that a car ferry will be perfectly feasible in this situation; and that large establishments will be willing to guarantee the efficiency of the engines and boats that may be constructed.

It is quite true, continues the writer, that a ferry would afford a material improvement in the method of communication between France and England, and would be of great value to the agricultural interests of France. Then comes the plaint that though the solution seems quite clear, it is probable that it will be a long time before it will be realized.

THE WESTERN PACIFIC.

BY GEORGE C. LAWRENCE.

Location and Traffic.

Before September, 1909, there will be in operation between San Francisco and Salt Lake City a new Pacific railroad, the most remarkable in point of construction which has ever been built in the West. The mere building of a line through a section of the country that in many parts has received no addition to its transportation agencies since the first Pacific road was opened, 40 years ago, would be noteworthy. In the case of the Western Pacific, however, a more significant feature is found in the fact that the new line is a road of thoroughly good, standard construction, built with a view to the greatest permanency and ultimate economy, resulting in increased earnings, that engineering skill can insure. It shows that the pioneer period of railroading is at an end in the West, and that the transportation business in this part of the country has reached the same settled and definite basis on which it rests in the eastern states.

In California a part of the new road is already in operation and the completed line will be open to traffic early in 1909. The need of a new line between San Francisco and the great coal and iron territories of Utah and Colorado has long been felt. The whole Pacific coast region, and particularly the fruit and grain-growing sections of California, has been growing at a tremendous rate, and the volume of both its outgoing and incoming freight has been limited only by the carrying capacity of its transportation lines, while its traffic possibilities have been far beyond the limits of these existing facilities.

No doubt some of the delay in solving this particular transportation problem came from the belief commonly held that it was impossible to build a road through the western mountains on the standard of grades and general construction adopted by the old and prosperous eastern roads. Yet what was thought impossible a few years ago is being accomplished to-day.

The Western Pacific engineers had before them three essentials: low grades, permanent construction and freedom from snow. The road most closely conforming to these requirements would be most successful in accomplishing its final purpose. The maximum grade in no case exceeds one per cent. Westbound, the maximum is only 0.8 per cent., while for 80 per cent. of its length the heaviest grade is only 0.4 per cent. As a result of this grade, the Western Pacific will be able to haul as heavy a train over the summit of its line with one locomotive as the best of other existing lines handles with two, effecting a very important saving not only in the cost of operation, but in maintenance and cost of equipment as well. A comparison of the Western Pacific with the other Pacific lines in this respect is shown by the following table:

Name of railroad.	Highest summits No.	Highest summits Feet	Max. gradient in ft. per mile. East-bound, per cent.	Max. gradient in ft. per mile. West-bound, per cent.	Total ascent overcome East-bound, ft.	Total ascent overcome West-bound, ft.
Canadian Pacific	2	5,299 4,308	237-4.49	116-2.2	23,106	23,051
Great Northern	3	5,202 4,146 3,375	116-2.2	116-2.2	15,987	15,305
Northern Pacific	3	5,569 5,532 2,849	116-2.2	116-2.2	17,830	17,137
Union Pac.—Cent. Pac. (Omaha-S. Francisco)	3	8,247 7,017 5,631	116-2.2	105-2.0	18,575	17,552
Un. Pac.—Ore. Sh. L. (Omaha to Portland.)	5	8,247 6,953 3,537 3,936 4,204	106-2.2	116-2.2	18,171	17,171
Santa Fe	6	7,510 7,453 6,987 7,132 2,575 3,819	175-3.3	185-3.5	34,003	34,506
Western Pacific	2	5,712 5,018	52.8-1	52.8-1	9.385	5.076

The importance of so building a road that it need be built but once has been strikingly taught by the later experiences of the older Pacific lines. It has been necessary in recent years to spend great sums on them in reducing grades, strengthening bridges, eliminating curves and in other respects reaching a condition of increased efficiency and increased earnings. This, of course, is no reflection on the creators of the earlier Pacific roads. When these lines were pushed across the continent the building of any kind of road through the unsettled western country was a remarkable feat. Financial success was problematical. If the roads had not been built cheaply and hastily they could not have been built at all. But now the situation is very different. The builders of the road have felt no doubt that there was going to be enough traffic for it; the wisdom of the most improved and most permanent form of construction has been demonstrated, and the best location, both from an engineering and from a traffic viewpoint, has been indicated by years of investigation of routes and resources. The builders of the Western Pacific have been fortunate in that they were able to profit by the accumulated experience of 40 years of Pacific railroad operation.

Oakland Terminal.

The Western Pacific will have no snow sheds. Throughout the whole line the cost of keeping the tracks clear from snow, the cost of operating snow plows and the loss from traffic delays will be reduced to an extent that will remove these items from comparison with other Pacific roads. The difference in this respect between the Western Pacific and its nearest competitor is shown by the following figures:

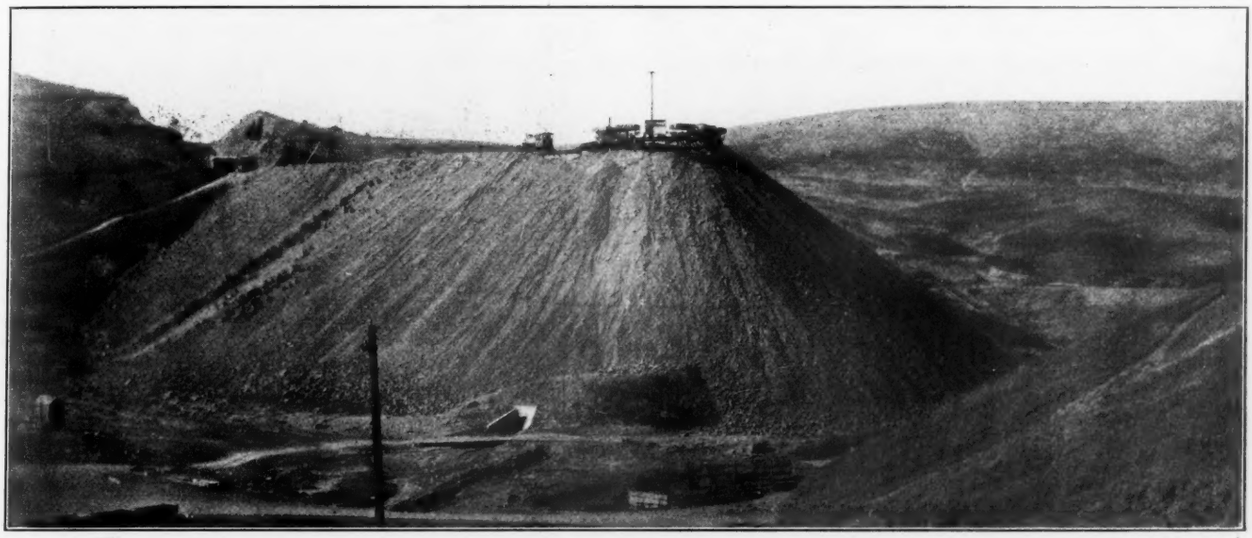
Snowfall During Winter of 1906-07.

	Western Pacific (Beckwourth Pass).	Nearest competing line (summit).
December	8 in.	40 in.
January	13 "	148 "
February	None.	96 "
Total for three worst months	21 in.	284 in.

Another advantage in eliminating snow sheds which will

be keenly appreciated by passengers who have suffered the monotony of riding through mile after mile of these structures, is the unobscured view from the car windows. In the nature of the case, snow sheds usually are placed on those portions of the line where the view if unobscured would be most attractive. The absence of them on a road that traverses some of the most beautiful and unusual scenic regions of the continent will doubtless recommend it to travelers.

One of the most profitable lines ever built was laid out in the following manner: A map of the territory which it was to serve was marked in colors varying in density according to the volume of freight production. Through the center of the most densely colored section the track was laid. The principle then established of following the line of maximum freight production has been adopted by the Western Pacific. At its western end the problem was simple. California's great garden produces every year far more fruit than existing lines can handle, and there is no doubt that this product will increase with every increase of transportation facilities. California, with practically the area of France, and even greater productive ability, to-day has less than one-fifteenth the population of that country. Northward, along the line of the new road, are the great timber, mining and cattle industries. Of timber alone, there is estimated to be 100,000,000 carloads in the country tributary to the Western Pacific. California's timber production in 1906 was 1,348,000,000 ft., worth $20,726,000, and there are still great tracts of virgin forest within the state. Its mines, in 1906, produced gold to the amount of $18,832,000, and silver to the amount of $1,027,000, and some of the most productive gold fields of the state are in the territory traversed by the Western Pacific. It should be noted, also, that the manufactures of California use raw material to the value of over $125,000,000 a year, and turn out some $360,000,000 in products. These industries are largely concentrated in San Francisco, Oakland, Stockton and Sacramento, all of which cities the Western Pacific serves.



Fill in San Diablo Range.

Highest fill on line, 123 ft. high and 1,120 ft. long. Showing circular unloader for handling dump cars.

The agricultural product of the state is greater in value than all the others combined. More than 90,000 carloads of fruit, wine and vegetables are shipped from California annually, and the trade in these products is increasing rapidly. There is also a heavy traffic, not covered by these figures, which is wholly within the state, from the producing points to the distributing centers, and especially to the port of San

Fill at Western Portal of Flower Lake Pass Tunnel.

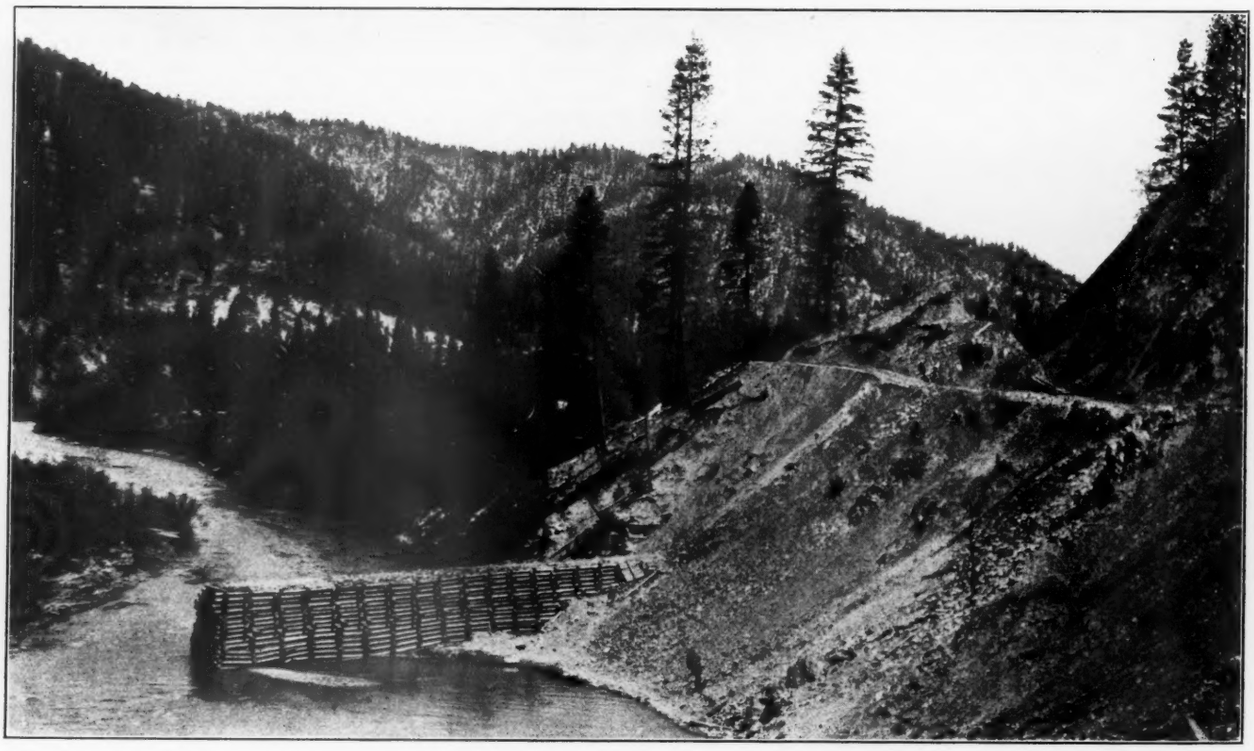
Francisco, which last year shipped abroad $33,000,000 of goods and in 1906 nearly $40,000,000. The imports into San Francisco, which for the most part are distributed by rail to interior destinations, were $54,000,000 in 1907, and over $44,000,000 in 1906.

It is possible, however, to obtain more detailed figures on the traffic yielded by the regions which the Western Pacific reaches. In California the road touches or crosses the counties of Lassen, Plumas, Sierra, Nevada, Butte, Placer, Yuba, Sutter, Sacramento, San Joaquin, Santa Clara, Alameda, Contra Costa, and Solano. These counties include the portions of the Sierra, the valley and the bay regions directly tributary to the road. In addition, its connections in the south will open to it the San Joaquin valley, embracing the counties of Fresno, Kings, Madera, Merced, Stanislaus, Tulare and Kern, the trade of which passes naturally through Stockton.

In the year 1906 the products of these counties shipped out of the state included 4,781,000 boxes of fresh fruit, 118,519,000 lbs. of other orchard and garden products, 2,207,000 gallons of wine and brandy, 5,662,000 lbs. of wool, and 1,000,000 bushels of grain, besides dairy and poultry products in large amounts.

In Castle Canyon, 26 Miles West of Beckwourth Pass.

Cut 30 Miles West of Beckwourth Pass.



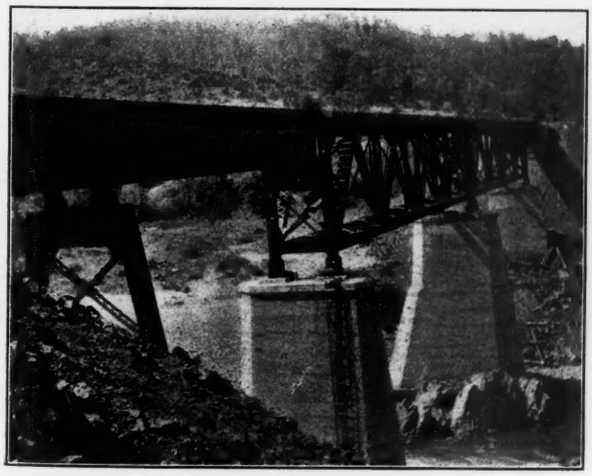
Wing Dam on North Fork, to Protect Roadbed.

These figures do not represent the entire output of the counties mentioned, but merely that portion which was reported as shipped beyond the boundaries of the state. Even on this point the returns are not a complete representation of the traffic produced by the district covered. For example, those portions of the products first shipped to one of the several distributing points within the state and then transshipped

Serpentine Canyon, Feather River.

to destinations in another state, are in large part not included, or are credited as products of the place of transshipment. Nor do these figures take any account of the traffic wholly within the state. The traffic possibilities of the territory directly reached by the Western Pacific may be better indicated by figures showing some of the products of the first group of counties enumerated—those adjacent to the main line of the road. These included in 1906, among other articles, 1,285,000,000 lbs. of green fruit, 355,000,000 lbs. of dried fruits, 14,000,000 bushels of grain, 1,000,000 tons of hay and alfalfa, 2,000,000 cases of canned fruits and vegetables, 13,000,000 gallons of wine and beer, 53,000 tons of sugar beets, 12,000,000 lbs. of butter and cheese, and 158,000,000 ft. of lumber. In addition, the manufactories of these counties turned out in 1906 products to the value of $67,500,000.

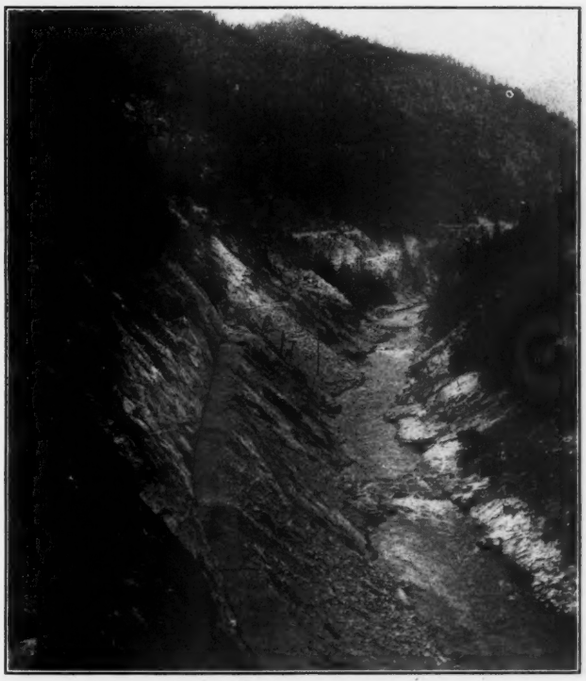
The total mineral product of California for 1906 was $46,776,000. Of this amount the 14 counties embraced in the territory directly traversed by the Western Pacific Railroad produced $9,713,000. It is estimated that over $50,000,000 has been taken from the gold-bearing gravel beds at Oroville, and lands which a few years ago could be purchased for from $10 to $50 an acre now sell at from $1,500 to $2,000 per acre.



Bridge Over Feather River at Bidwell, Cal.

Quartz and hydraulic mining is an important industry in Sierra, Plumas and other mountain counties. In Plumas are located such famous gold producers as the Plumas Eureka, from which $12,000,000 has been taken; the Green Mountain, which has yielded $7,000,000; the Crescent, Cherokee and Gold Stripe. The gold mines of Sierra county have yielded $190,000,000. There are also extensive copper and iron deposits, which are awaiting adequate transportation facilities to make their development profitable. The copper deposits of this region are the continuation of the Shasta belt, on which are situated farther north the famous Keswick, Bully Hill and other properties, producing about $5,000,000 annually. The same section of the state which contains the richest mineral resources tributary to the road likewise contains the greater part of the standing timber in the Western Pacific territory.

From the summit of the Sierras to Salt Lake City the Western Pacific draws a line across Nevada and Western Utah. Nevada is rich in mineral resources, and some of its most promising districts lie along the route of the new road. Deposits of sulphur, borax and salt, gold, silver and copper



In Feather River Canyon, 42 Miles East of Oroville.

occur along the line between the border of California and that of Utah. Moreover, irrigation has proved that the soil of Nevada is rich. In the Truckee-Carson river country, where an irrigation project of the United States Government is reclaiming some 350,000 acres of land, the beginnings of a prosperous agricultural community have already sprung up. The country which is traversed by the Western Pacific is as rich in soil potentialities as any in Nevada.

When the Western Pacific is in operation the value of this country will be realized upon. The mines, which communication will make it profitable to develop, will send their trainloads of ore eastward to the smelters in Utah, while the mining communities themselves may be expected to furnish markets near at hand for the lumber and farm products of California, and their presence will encourage the further development of grazing and irrigation. During the decade ending with 1906, the sales of public lands in Nevada amounted to over 1,600,000 acres. The 1907 wool crop of the state was 6,000,000 lbs., one-half that of California, and its value was more than $1,250,000. The manufacturing interests of Nevada

use raw material to the value of over $1,600,000, and their product amounts to over $3,000,000 yearly. These industries have tripled since 1900. The gold production of the state in 1906 was $9,278,000, ranking after Colorado, Alaska and California. The previous year it was $5,359,000. There was also a silver production of $3,525,000, exceeded in amount only by Montana, Colorado, Utah and Idaho.

In addition to the freight produced it is necessary to consider also the freight which the country needs. Could the West get it, it would to-day be importing from the East many times its present consumption. Here, again, it is not a question of the needs of the West, but of the handling capacity of the existing lines. The builders of the Western Pacific believe that it will start off with earnings of more than $9,000 a mile, a record which, if achieved, will be unique as compared with any other western line. The eastern lines will, of course, feed the Western Pacific with westbound freight, and receive eastbound freight in return.

A truth that is better understood to-day than it was a

Foundation Work for Willow Creek Viaduct, Castle Canyon, Cal.

Will be longest viaduct on line, 1,004 *ft. long and* 165 *ft. high.*

generation ago is that a road cannot succeed without adequate terminals. At San Francisco the Western Pacific holds valuable terminal properties on both sides of the bay. On the San Francisco side it has 269 acres, of which those devoted to the local freight terminal, 53 acres in all, are in the heart of the city, only seven blocks from the city hall. Connecting with this is the water-front equipment of storage yards and docks comprising 216 acres. On the Oakland side there are 361 acres, and between the two lies the most direct passage across the bay. Along this busy water-front are gathered vessels from all the seven seas, bringing the products of the Orient, the Pacific islands, golden Alaska, and far-off Australasian lands, to receive in exchange the grain and machinery and other manufactures of America, brought westward by the railroads. As varied they are as the early ships of the Argonauts which anchored here in '49, if not as picturesque. It was the prospect of overseas trade, added to their military importance, that led the federal government to aid in the construction of the early Pacific lines. Nobody gave much thought to the possibilities of traffic development along the lines themselves that would be stimulated by their construction. The export and import trade of the Pacific coast is of vastly greater importance to-day than it was in this earlier period, and is certain to expand with the expansion of American interests in the Pacific, but the growth of traffic originating in local territory has been so marvelous that it has relegated the foreign trade to the background in the calculations of railroad builders and managers.

Out from San Francisco the road runs easterly and then

Castle Canyon.

turns to the north, skirting on the east the half-submerged "tule lands" and following a direct line from Stockton to Sacramento, Marysville and Oroville. This part of the line has been designed to tap the richest of California's great valleys producing annually millions of tons of freight which cannot be handled by existing lines. From Sacramento to the South are broad and productive valleys, rich in freight and offering little in the way of difficult problems to the railroad engineer. North of Oroville, stretching across the eastward route, loom the Sierras—mountains so forbidding and rough that in the length of a thousand miles the passes through which a railroad may go can be counted on the fingers of one hand.

From Sacramento to Oroville the line runs up that part of the Sacramento valley watered by the Feather river, one of the greatest fruit-growing sections of the country. This portion of the line south from Oroville to Oakland is the part first opened to traffic, producing an important income even before

Heavy Rock Cut in Castle Canyon.

the road is finished. Oroville itself for more than half a century has been the southern gateway for all the trade of the wonderfully rich country of the Feather river and is the point through which most of its supplies come. Strangely enough, until the coming of the Western Pacific, Oroville has never been located on a through railroad line. The Southern Pacific has a spur running northward from its main line to Oroville, but that has been all that the town has had in the

Standard Concrete Culvert.

way of transportation facilities. The Western Pacific, seeking to serve this important traffic producing region, has swung north of the Southern Pacific, reaching into new territory, not to cross the older line until midway across Nevada. One reason for following this route is furnished by the great amount of timber in the territory tapped.

"City of Gold" is the literal equivalent of Oroville, and city of gold it really is. Sluiced, hydraulicked, mined in every possible way from the earliest times, this city on the gold bearing Feather river, is still one of the greatest gold producers in the country. But it is a sad spectacle for the landscape gardener. Girt around by green orchards and ranches, its midst is a bare waste—unending piles of bare brown hills of dirt and gravel piled up by the dredges which can pay good returns by chewing up the soil at the rate of 2,000 yards a day, with a yield of twenty cents a ton in gold. Eating up the country as they go, these huge monsters leave behind them only a macerated mess of barrenness. Watching the huge scoops as they draw in the earth one sees old diggings tunnels and shafts, ruthlessly torn away—the memories of former searchers for wealth. But as one man said, the commercial instinct cropping up, "its a great country for freight."

Steel Draw Span and Finished Track.

Northward on the foaming Feather river, three miles above the city, there is a great steel bridge, indicative in its solidity of the whole road, and at the bridge is a station called Bidwell. It is named after the old pioneer, scout and Indian fighter, General Bidwell. One may wonder at the solidity and permanence of this bridge—typical of the whole line. But the wonder disappears when the wrath of the Feather river is known. With the melting of the winter snows it mounts by feet to the point which an engineer described as one "unsafe for anything but steel."

Up the North fork of the Feather river, and then eastward

Segmental Timbering Used in Tunnel Work.

on the east branch to the junction with the Middle fork, is a country teeming not only with freight and riches, but with romance. There is Rich bar, once the stamping ground of gold seekers on the Feather river, which within its small confines held a warring, brawling population of 3,000 persons. They are gone now and the boisterous camp of early years is a peaceful ranching country. Scores of "flats," as they are called, mark the course of the river, level farming territory with the mountains rising on each side in scenery which in its variety and continuity is excelled along no railroad in the country. For the greater part of its course on the North fork the railroad follows the left bank of the rushing stream. The old Indian trail followed the right bank. Naturally one would expect that the railroad, too, would follow it instead of the other where, before it came, passage was impossible even for a man on foot. But in these gulches and canyons the snow

may vary many feet on the two sides, and so the Western Pacific, looking for a snow free route, chose the sunny side.

There is a Dutch bar, too, on the way up the river. It once possessed a mining population of 40,000. Now it has hardly 1,200. But the change in population has been a change in production and to-day the district abounds in potential freight waiting for the coming road.

Far up in the Sierras the line leaves the northward bearing North fork to follow its east branch, and finally in Plumas county to cross to the Middle fork and thus eastward. Here valley follows valley of wonderful fertility girt around by rich timber, mineral, grazing and agricultural districts. Sierra, Indian, Mohawk and other valleys—all these are gardens waiting for the railroad to move their freight. Above Mohawk valley, in a territory of surpassing richness and beauty, the line crosses to the Middle fork to follow it into

Palisade, Nev., Where Southern Pacific Is Crossed.

the Humboldt sink. Here, too, lies the crux of the engineering problem, which has been solved by turning the railroad back upon itself in a mile long loop, and then taking it through a 7,300 ft. tunnel. By this loop development work, as it is called, some 50 ft. in elevation is gained, the road literally passing over itself.

One of the great problems to be solved in this country of swelling and shrinking streams is that of drainage—the question of successfully disposing of the water rushing down the mountain sides in such a way as to protect the road bed. In the past, as every traveler knows, these streams have been carried directly under the road bed through culverts or similar construction. But on the Western Pacific, with permanency and safety always in mind, a new method has been employed, ingenious in its conception. Instead of carrying straight down the devastating mountain streams with their impinging heads which more often than anything else bring washouts and consequent losses, the engineers have evolved a new practice. The water is still carried under the roadbed, as it runs along the mountain side, but in a new way. In the first place it is diverted, that is, carried to one side before it is allowed to run out through a culvert, and, second, before being brought

Concrete Wall to Deflect Mountain Stream from Roadbed.

to the point of discharge, its grade is carried upward, thus reducing its force to a minimum and eliminating the danger of washouts.

From the Spring Garden Tunnel—as the pass is known by which the Western Pacific crosses from the North fork to

Beckwourth Pass.

Continental divide; summit of 1 per cent. grade. Tunnel, 6,006 ft. long.

the Middle fork of the Feather river—is another series of fertile valleys, surrounded by timber, grazing, farm and mineral regions. At the northeast corner of Sierra valley, a tract of some 67,000 acres underlain by artesian wells, and capable of great production, lies Beckwourth tunnel, 6,006 ft. long, opening on the eastern slope of the Sierras into Long valley. At the eastern end of the tunnel is a station to be called Rainbow.

Once over the Sierras the engineering problems are comparatively easy. Still north of the Southern Pacific and always in a country of great freight resources, the Western Pacific runs somewhat south of east until it crosses the Southern Pacific at Palisade in Nevada. Thence it is always to the south of the older road, running in a nearly straight line to Salt Lake City. Just west of the state line between Nevada and Utah lies the great Flower Lake Pass tunnel, so named apparently because there is no lake there. Before reaching it the road strikes the Delle pipe line, which brings water from the mountains to supply the locomotives. From the eastern end of this mile-long tunnel, on which occurs the

On Spanish Creek, 73 1-2 Miles East of Oroville.

highest elevation of the line, the road dips down into the great Salt Lake desert, and runs eastward to Salt Lake City. On this section occurs what is probably the longest stretch of straight and level track in the West. Running across the desert it lies straight and flat for nearly 45 miles—the first road to penetrate this stretch of salt and sand. Here is another romance—that of the Desert—and another commercial factor—the great salt beds. For 20 miles the road crosses them—beds of solid salt which, now some 8 ft. deep on the average, used to be a 1,000 ft. below the surface of that now comparatively shrunken body of water—the Great Salt lake. Until the coming of the Western Pacific no engineers had dared to attempt the crossing of this desert—a weirdly fascinating region with its wonderful colors of sunrise and sunset.

Around the southern end of the lake the line moves into Salt Lake City, 927 miles by the road from the bay of San Francisco. Throughout its length it is marked in a wonderful manner by a construction new to that territory. It is a road built right in the beginning, with such grades and such absence of snow as to give it an advantage over all others.

HOME VIEW OF ITALIAN STATE RAILWAY MANAGEMENT.

The railroads of Italy were desperately in need of an improvement in service, and the people clamored for state management. The state has taken over the control and the following article, translated from the *Marina Mercantile Italiano*, is significant of the present conditions:

"No one with a good memory can have forgotten the political polemics vehemently demanding the operation of the railways by the state.

"The accusations that were brought against the private management were infinite in their variety; the material used, exorbitant rates, personnel without discipline, employees acting beyond the limits of their authority, innumerable favorites and sinecures, delapidation, absence of control and everything that constitutes a detestable condition of affairs.

"On the other hand, the advocates of state control colored that condition with the most delicate of roseate hues; we were to have new and fast rolling stock even though it might not be exceedingly elegant; rates were to be reasonable; employees were to be obedient and attentive to their duties while the actual number was to be greatly reduced. There was to be an abolition of favoritism and sinecures; a punishment of abuses and in all construction and operation there would be the exercise of the greatest possible economy, all resulting from state control.

"Thus there was presented a picture of what would be given to the world. But the old conditions have continued and the whole railroad atmosphere is under a cloud. The press echoes the complaints of the public and the recriminations are thickening. But the defenders of the state have not lost an ounce of assurance.

"They hasten to say that the beginnings of any enterprise cannot be free from imperfections; certain inconveniences are inseparable from the transition period; rolling stock cannot be created in a day nor can the customs of the personnel be changed in a month; the difficulties and problems attending the transference of a property from one holder to another are inevitable, and so on.

"Very good! But we have found that the period of trial is getting to be quite prolonged. We have reached that second stage in which it is permitted to pass judgment on the advantages and disadvantages of the system; and things are bad, very bad.

"The facts which go to prove this statement come from reliable sources and the serious press of the country comments on them with a tone of discouragement, for they are varied and numerous.

"We have learned, for example, that 880,000 lbs. of pumice stone have been bought, as well as 250,000 meters of red velvet at 15 lire per meter, or quite enough to last up to the twenty-first century.

"At several stations an enormous quantity of wood has been accumulated. Millions have been spent in the purchase of uniforms, and they are stored away in the warehouses with no explanation as to the reason for the purchases. These uniforms are sufficient to last for centuries. And the mournful litany does not end with that. Here are other revelations published by the *Gazetta del Populo* showing into what a chaos of disorder the administration has fallen. Numbers of locomotives have been abandoned. * * * They bought 2,000 reinforced concrete ties, but these were soon laid aside because they were not usable. On July 1, 1905, the personnel of the three systems of railways consisted of 97,000 employees; there are to-day 137,000! * * * Then comes the chief inspection, the administrative council, the traffic council, the general administration with 13 services to look after, ten departmental administrations, 500 separate offices, an infinite number of offices with inspectors under pay at 1,500 lire per annum.

"The administration already acknowledges that there is a

deficit, and yet continues to augment the number of employees, thus adding confusion to the disorder already existing. The question is, where will it end?

"Industrial Italy has made enormous progress by its own energy and despite an execrable fiscal and legislative regime. Now, in order that it may not lose the ground that it has gained and in order to avoid foreign encroachment, it should become more active and sure of itself every day and establish railroads that will be convenient, economic and duly protected and guarded. The sea, the great international highway, should be as open to Italians as it is to the foreigner. An industrial state should not be made subject to a state control independent of the industries of the country, but the government should protect and not absorb or denaturalize them."

AUTOMOBILES AT RAILROAD CROSSINGS.

BY JOHN E. BRADY.

It is a well-settled rule of law that a traveler approaching a railroad crossing is bound to make use of his eyes and ears, so far as there is opportunity, to the end that he may avoid being run into while crossing. And, if the unwary traveler fails to make proper use of his senses upon such an occasion, when the exercise of those senses would have enabled him to cross in safety, he cannot hold the railroad company for the damage resulting from a collision with one of its trains, notwithstanding the employees of the company failed to give signals or were otherwise negligent. The rule is familiarly referred to as the "Stop, Look and Listen Rule." It is enforced in many jurisdictions, and especially in the state of Pennsylvania, where it is so strictly adhered to that, if a traveler cannot get a view of the track from the vehicle in which he is riding, he is required to get out and approach the crossing on foot, or be open to the charge of contributory negligence. (P. R. R. v. Beal, 73 Pa. State, 504.)

The courts have recently had occasion to apply this rule of law in cases where travelers by automobile came to grief while crossing railroad tracks, and instituted suit against the company to recover damages sustained. Of course, no new rules of law have been formulated by the courts to govern the operation of automobiles upon public highways. Apart from the statutes regulating them, which have been passed, they are subject to the law of the road as it now exists and is applied to other users of the highway. The operators of such machines are bound to exercise the same degree of care as the drivers of horses or other animals, and pedestrians.

In the case of Turck v. New York Central & Hudson River Railroad Co. (108 N. Y. App. Div. 142), the action was to recover damages for the death of a person which occurred while he was running an automobile over a railroad crossing, as a result of being run into by a train. The deceased was a young man, 19 years old, in full possession of his faculties and experienced in the operation of the machine which he was driving. Telephone poles and fences partially obstructed his view of the tracks in the direction from which the train came, but it appeared in the evidence introduced at the trial that when he was 140 ft. from the crossing he could have had a view of the track for a distance of 200 ft. had he taken the precaution of looking, and that the distance for which the track could be seen increased materially as he approached the crossing. A carriage drawn by horses, in which were riding friends of the deceased motorist, directly preceded the automobile, and the driver of the horses testified that he saw the oncoming train and was just able to clear the tracks in time. The driver of the auto either did not see the train or deliberately drove on the tracks at a time when it was impossible for him to cross in safety. In either event, he was guilty of negligence contributing to the accident and was, therefore, not entitled to recover damages.

The rule requiring care on the part of the traveler applies as rigorously to one riding as a passenger or guest in an automobile as to the operator of the machine. But an exception is made in favor of persons who, on account of their immature years, or for some other reason, could not reasonably be expected to take the precautions generally required. And in determining whether or not a failure to look or listen is negligence, the age, condition and situation of the passenger and the existing circumstances are to be taken into consideration. As was said in the case of Noakes v. New York Central (106 N. Y. Supp. 522): "It is not in every case that a failure to look or listen would be negligence, as in the case of a passenger in a street car which is entirely under the management and control of those charged with its management, or in the case of a very young child in a conveyance approaching the track." In other words, "it must not only appear that there was a failure to look and listen to constitute contributory negligence as a matter of law, but it must also appear that there was nothing in the age or condition of the person injured, or in the attending circumstances, which excused or would have rendered unavailing any knowledge that was required by the person injured."

The exception is illustrated in the case of Sherwood v. New York Central (105 N. Y. Supp. 547), which case arose out of the same accident as the Turck case, referred to above. The plaintiff was a boy of 16 years of age, and was riding in the auto at the time of the accident upon the invitation of the operator whose life was lost in the collision. It was held that, in consideration of his tender years and want of knowledge as to the operation of the automobile, the fact that it was being driven by an older person whom he knew was familiar with its working, and that friends were driving in a carriage immediately ahead of him and were making the crossing, it could not be said as a matter of law that he was guilty of contributory negligence. And it was further held that the fact that he might have saved himself by jumping from the auto did not alter or modify the liability of the railroad company, for the defendant's negligence created the emergency and the plaintiff could not be required to choose at his peril what ultimately would prove his safer course.

Another case which brings in the same exception is that of Noakes v. New York Central, previously mentioned. While supporting the general rule that a traveler by automobile is bound to look and listen for approaching trains when drawing near a railroad crossing, the case holds that the rule does not apply to a young girl riding between two other persons in the tonneau of her father's automobile, where her father was in the front seat of the machine with the chauffeur and she was not in a position to give orders or direct the operation of the machine in any way. It was also held that the negligence of the chauffeur in driving the machine in front of the train could not be imputed to her. The passenger in such a case must be judged by the duty that the law imposes upon him under the circumstances existing at the time of the accident.

A companion case to the Noakes case is Read v. New York Central (107 N. Y. Supp. 1068), where the Appellate Division decided against another occupant of the automobile, injured in the same collision. In this instance, the plaintiff was a man 36 years old, in full possession of his faculties, and riding in the machine as the guest of the owner. It appeared that he had an unobstructed view of the track for a distance of 2,000 ft., and it was held that his failure to take advantage of that view and look for trains that might be coming was contributory negligence. The chauffeur, who was driving the auto at the time of the accident upon which the Noakes and Read cases were based, also brought suit against the railroad company, the case being known as Spencer v. New York Central (108 N. Y. Supp. 245). Nothing appeared which would excuse the chauffeur from exercising due care in approaching the crossing. It was held that he was guilty of negligence in running the machine upon the crossing without having taken the precaution to look and listen and that he could not for that reason recover damages.

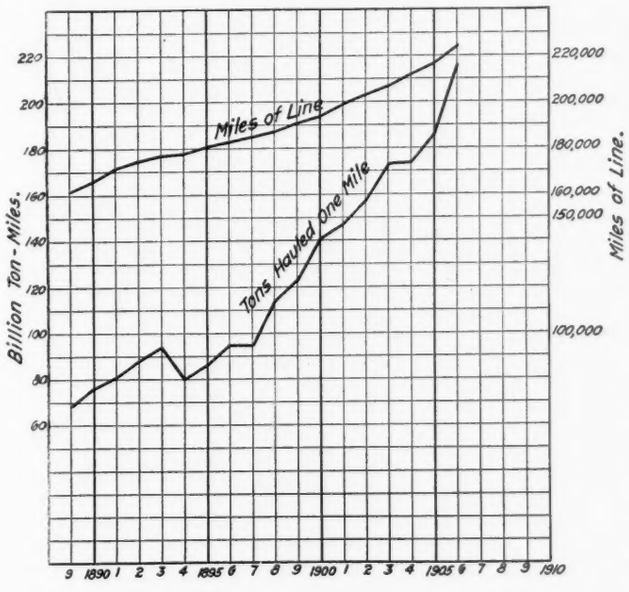
THE THEORY OF RAILROAD RATES.

BY WILLIAM Z. RIPLEY.
Professor of Economics, Harvard University.

III.

The application of the law of increasing returns to railroads in actual practice is beset with difficulties. In order to make these clear, it will be necessary first to describe the phenomenal development which has taken place during the last two decades.

The freight service of the railroads of the United States, measured by weight, in 1906 amounted to 896,000,000 tons. Only since 1899 when the corresponding figure given by the Interstate Commerce Commission was 501,000,000 tons, have accurate data been obtainable. This would indicate a growth in eight years of about 80 per cent. But this figure takes no account of the distance each ton of freight travels. This factor is included in what is known as ton-mileage—that is to say the equivalent of the number of tons of freight carried one mile. Obviously, so far as the amount of service rendered is concerned, one ton carried a hundred miles in the equivalent of one hundred tons transported one mile. Each carrier totalizes in this way each ton of freight movement by multiplying it into the distance it is transported. For the United States as a whole, this ton-mileage in 1906 was 215,877,000,000 —that is to say the service rendered would be represented by the carriage of that number of tons one mile. The appended diagram shows the phenomenal rapidity with which this transportation service has grown since 1889.



Relative Growth of Mileage and Traffic.

The rapid growth up to 1893 was suddenly interrupted by panic and subsequent industrial depression lasting for about four years. Recovery began in 1897, since which time the freight movement has increased by leaps and bounds from about 95,000,000,000 ton-miles to 215,877,000,000 ton-miles in 1906. It is obvious that the growth of transportation in any country is bound to be more rapid than the increase either in population or in wealth. It appears, indeed, almost as if the volume of transportation in the United States increased more nearly as the square of population than in direct proportion. It has been estimated that we forward two and a half times as much freight per capita as some of the leading European countries like France. Our domestic population from 1889 to 1905 increased about 40 per cent. The railroad mileage grew about 46 per cent. Yet the freight service surpassed this rate of growth six times over. The appended diagram is intended to illustrate the relative rapidity of this development. While population and mileage increased about one-half, the railroads in 1906 hauled the equivalent of three times the volume of freight traffic handled in 1889. At the beginning of this period, the railroads had to seek the freight. Now it appears that traffic normally will seek the railroads. At times, even as in 1906-7, the railroads have actually sought to escape the flood of business presented.

The magnitude and importance of the growth of tonnage, as above described, is revealed by the rapid increase in railroad earnings. Gross revenues of American railroads in 1889 were about one billion dollars. In 1907 they amounted to $2,589,000,000. Thus it appears that gross earnings practically now equalled two and one-half times the amount of 18 years before. The net income available for dividends has grown even faster. The increase of 1906 was, roughly speaking, about 350 per cent.; namely from 101 millions in 1899 to 457 millions in 1906. Nearly two and one-half times as much money went annually to the owners of railroad securities as dividends and interest, besides leaving surplus earnings for 1906 of about 243 millions available for improvements and surplus. But the limit of utilization had about been reached on many roads, and an era of extensive capital outlay to increase the existing plants and facilities ensued. Indications are not lacking to show that at the height of activity before the industrial collapse of 1907-8, such a point of saturation had been reached, especially in Trunk Line territory and on the northern transcontinental lines. On the Northern Pacific, for instance, the ton-mileage increased from 2.2 billions to 5.2 billions between 1900 and 1906. The Northwest was suddenly confronted with the new issue of enlarging facilities, which had been slowly becoming apparent elsewhere in the country during the preceding decade. Grain rotted on the ground, and an acute coal famine occurred, because of sheer inability of the roads to care for the new traffic. Changes in methods of business somewhat exaggerated this strain upon carriers. Merchants now expect quick delivery to order. They object to stocking up months ahead even when conditions are auspicious; therefore business comes with an irresistible rush. All these causes, coupled with undiscriminating attempts by inadequately bedded roads to imitate the methods of progressive ones, by prematurely increasing their train loads, led to a practical breakdown of the transportation business of the country in the autumn of 1906. To the student of transportation, this congestion denoted the attainment of a point of saturation for the then existing physical plant.

A comparison of the growth of business and of operating expenses for the entire railroad systems of the United States over a series of years is given in the following table. The results are expressed by means of index numbers based upon the year 1880, taken as 100.*

Relative Increase in Traffic Items, Operating Expenses and Revenue From 1880 to 1906, inclusive.

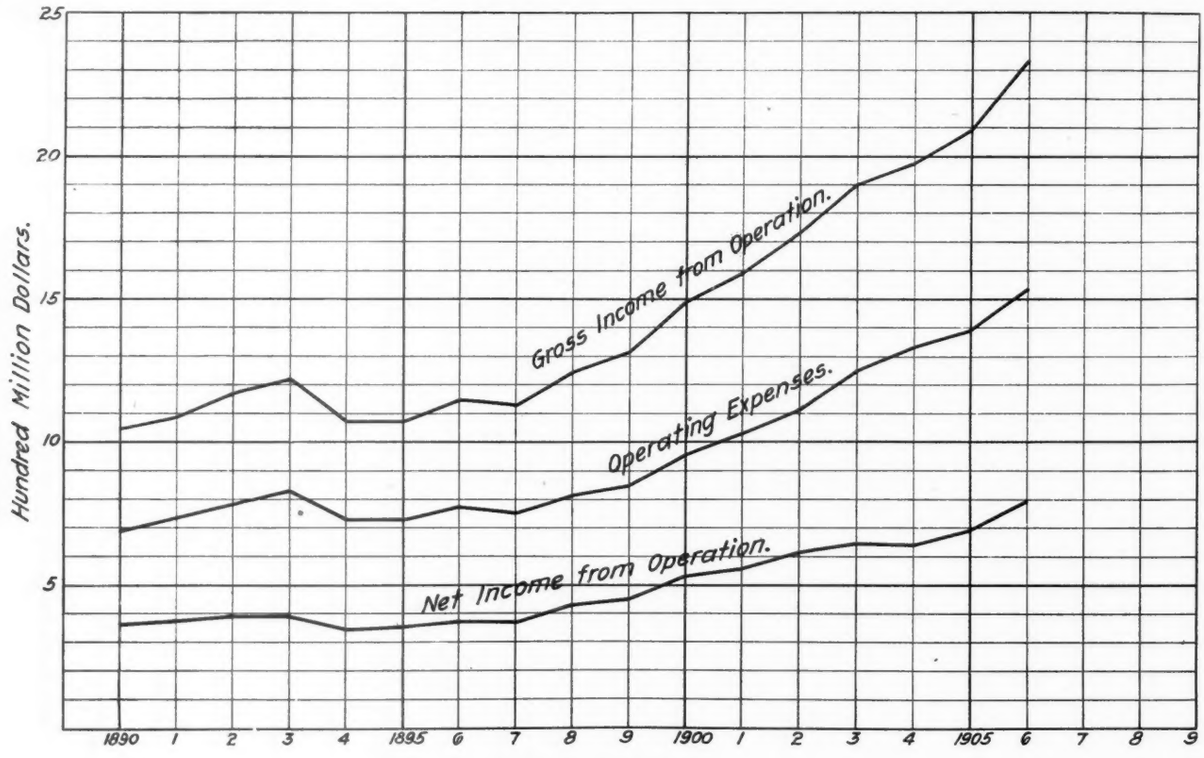
Items.	1880.	Average, from and inclusive 1881 to 1885.	1886 to 1890.	1891 to 1895.	1896 to 1898.	1904 to 1906.
Ton-miles of freight ...	100	134.36	203.23	264.90	313.81	595.0
Passenger miles of passengers	100	138.12	189.46	233.15	224.65	412.0
Operating expenses	100	132.75	174.39	215.30	221.42	394.0
Gross income from operation	100	.....	.....	183.0	190.0	346.0

From this table it appears that between 1880 and 1906 the ton-mileage of freight has grown about sixfold, and the passenger business more than fourfold. Operating expenses on the other hand in 1906 were less than four times as great as in 1880. Increasing returns are quite evident. The period from 1880 down to 1896-8, before the recent general increases in prices and wages took place, shows this even more strikingly. In order to transport more than three times as much freight and two and one-quarter times as many passengers, it

*From Report of Commission to Investigate the Postal Service, 1901, p. 220; brought down to date.

required a direct outlay for operation of little more than twice as much money.* On the other hand, owing to the rapid rise of all operating costs since 1898, a comparison of expenditures confined to the last 10 years by themselves, affords an apparent contradiction. The results for this period have already been given, classified in greater detail. And yet despite this disturbing factor and the one earlier mentioned, that these later operating expenses have been heavily loaded with improvement expenditures, it appears by comparison of 1895 with 1905, that passenger business has more than doubled and freight business is two and a half times as great, while operating expenses in 1905 are not much over twice their amount 10 years before.

A comparison of the movement of gross earnings with operating expenses introduces still another disturbing factor, namely, the changes from year to year in the level of freight rates as well as in the character of the traffic handled. The effect of fluctuating costs of production of transportation having just been considered, we may now turn to the fiscal returns as affected by the price obtainable for the service given. Any long-time comparison of results reflects the influence of the steady decline of freight rates during the generation prior to 1900. Thus comparing 1880 with 1898, as shown by the preceding table, operating expenses grew in the ratio of 100 to 221, while gross income grew from 100 to only 190. Threefold the freight business produced less than twice the revenue. Pushing the comparison later down to 1906, operating expenses grew after 1880 from 100 to 394, while gross income rose to only 346. This reflects the influence during the last few years of the rapid rise in prices and wages. Still another comparison may be effected by means of the chart hereby.



Earnings and Expenses.

According to this diagram, comparing 1890 with 1906, both operating expenses and gross revenue from operation seem to have moved together; the curve of gross revenue rising only a little faster than that for operating expenses. The former have risen from a general figure of about $800,000,000 before the depression of 1893-7, to $1,536,000,000 in 1906; the latter from about $1,200,000,000 to over $2,300,000,000. Operating outlay in other words somewhat less than doubled, while gross income was slightly more than twice as great. At times, especially during the rapid revival of business after 1897, before rising prices began to affect costs of operation, extraordinary increases in earnings appeared, outstripping the growth of expenditures. Comparing the year 1899 with 1895 we find that the gross earnings of the railroads of the United States increased by 22 per cent. This involved an increased expense of operation, however, of only 18 per cent. Similar comparison year by year, there having been an enormous expansion of business, shows an increase in gross earnings somewhat more rapid than the growth of operating expenses. This differential advantage progressively lessens after 1902. These relationships would be more striking could we exclude the enormous expenditures for betterments which have been charged to operating expenses during these years. Comparisons of net earnings are vitiated by uncertainty upon this point. Working over these results by comparison per mile of line, it appears that the rate of increase in earnings per mile of line, for five years prior to 1900, was approximately double the rate of increase of operating expenses per mile of line. Applying this law, for instance, to a particular road, the Missouri Pacific, by comparing the lean year 1894 with the prosperous year 1899, we have an increase of gross earnings for this road of $6,250,000; this expansion of business, however, cost only a trifle over $3,000,000 more for expenses of operation. The greatly lessened cost of performing additional business becomes at once apparent. These latter conclusions, as has been said, cover only a brief period of time. Judging by the results over many years, it appears that changes both in the level of freight rates and of wages and prices have operated to leave the railroads not much better off than they were some time ago. The only thing which has saved them whole in the face of rising prices and wages since 1900, has been the rise of freight rates and the enforced improvements in operation. With the methods of transportation, such as size of cars and locomotives and train loads as they were a decade

*Between 1890 and 1906 freight-ton mileage rose three times over, viz., from 76 to 216 billion ton-miles. Operating expenses grew from 692 to 1,536 million dollars, or about two and one-quarter times.

ago, very real distress would be more widely apparent than it was. On the whole, the public seems to have shared in the benefits of these improvements to a considerable degree. This statement, however true for the entire railroad system of the country as a whole, does not by any means represent the facts for any single system. Moreover, it is not by any means clear how fully the railroad system of the country has been enlarged and improved out of surplus earnings. There is reason to think that foundations have been laid during these prosperous years, for largely increased tonnage in the next few years, without a corresponding growth of expenses chargeable to plant; in other words, that the transition to a distinctly higher grade of operation has been effected out of surplus savings.

The comparison of gross and net earnings from operation, if expenditures have grown about as fast as gross income, confirms the preceding conclusions. Surveying the chart for the period since 1890, it appears that net earnings for the railroads of the United States have a little more than doubled up to 1906, this being, as has been shown, about the rate of movement for operating expenses. Examination of the years of rapid revival after 1897 by themselves, however, especially for individual companies, shows striking results. This is especially true of roads, not then developed up to a fair working capacity for their plants. Thus, for instance, on the Chicago, Rock Island & Pacific Railway, as between 1895 and 1900, we find that gross earnings increased 45 per cent., while the increase in net earnings was 73 per cent. The Chesapeake & Ohio, able to earn net only $2,206,000 in 1891, with a ton-mile revenue of 5.25 mills, in the fiscal year to July, 1901, earned more than twice as much, at a revenue per ton-mile of only 3.43 mills.

An interesting comparison with the previous decade, 1870 to 1880, exemplifies this relation still further. The gross earnings of the trunk lines of the United States decreased very greatly per mile of line from $7,211 in fact to $6,636, but at the same time the net earnings steadily increased. This was due primarily to the great volume of business developed, the ton-mileage increasing more than threefold during these ten years. It happened despite the fact that the mileage of line during the same time nad more than doubled. The following decade, 1880 to 1890, was represented by an increase of only 82.7 per cent. in mileage, while the number of tons of freight hauled one mile increased by 132 per cent. Density increasing in this way, a corresponding ability to carry at a lower rate per ton was a necessary result. So indisputably has this law—that an expanding volume of business up to a certain point, may profitably be carried at a continually lowered cost—been proved, that it is estimated by so competent an authority as the *Engineering Review** that, provided sufficient tonnage be available for 2,000-ton freight-train loads, a cost of one mill per ton-mile can be attained. Its significance may be realized from the fact that the lowest revenue per ton-mile reported for the United States is 2.21 mills per ton-mile for the long-haul soft coal business of the Chesapeake & Ohio. This, of course, does not imply that any railroad in actual operation, carrying all kinds of freight, including a large proportion of local traffic, can in the immediate future hope to attain this result. It is intended only to show, that provided the volume of traffic be large enough, the cost of operation tends to decline as a matter of course, until the point of congestion for the existing plant has been reached. At this point a new cycle of costs of operation and of profits makes its appearance.

The most important single factor in the production of increasing returns upon a railroad is the density of traffic; that is to say, the amount of business which can be conducted with a given set of rails, terminals and rolling stock. In other words, it is the degree of effective utilization of the plant and equipment. It is too obvious to need demonstration, after what has been set forth concerning the nature of railroad expenditures, that economy of operation and consequently profits are more or less directly dependent upon this fact. Such effective utilization of the property may be secured in two ways: either by a large tonnage per mile of its line, or by a concentration of such traffic as it may have into large train loads, which can be transported at low cost. The first of these economizes the fixed expenses for roadway and line which respond but slowly to enlargement of traffic, by distributing them thinly over a large tonnage; the second economizes the mere movement expenses which tend to grow less rapidly than the size of the trains. For neither fuel consumption nor wages of train crews expands *pari passu* with the paying load. Fortunate the lot of the railroad which enjoys both these advantages, of density of traffic per mile of line and of a tonnage capable of such concentration in heavy units.

Traffic density—the tons of freight carried one mile per mile of line—is readily computed. The ton-mileage, representing the total transportation service, is merely divided by the number of miles of line operated. The following graded table for the fiscal year 1902-03, illustrates the wide range of this figure, according to the location of different companies and the nature of their business:

	Traffic density.	Percentage of tonnage—Agric'l products.	Products of mines.	Manufactures.
Rock Island Company	428,116	25	29	14
Chicago, Milwaukee & St. P.	605,139	23	24	17
Great Northern	657,102	..	..	..
New York, New Haven & H.	802,954	..	..	..
Wabash	885,208	24	32	9
Baltimore & Ohio.....	2,181,518	6	62	8
New York Central	2,163,000	16	44	12
Lake Shore ('05).....	3,355,209	..	..	..
Pennsylvania Company....	3,855,000	..	..	24
Do. (Pa. R. R. Div. '05)..	6,337,625	..	..	..

The first of these companies operates in a sparsely settled agricultural territory. The St. Paul system lies nearer Chicago, but is still largely dependent upon a local and rural constituency. The Great Northern—a great transcontinental trunk line—despite its sparsely settled western area, exchanges a large volume of through freight for the Pacific Coast for lumber and other bulky products carried east. The New Haven serves perhaps the most densely settled area in the United States, but much of its traffic is on branch lines and is of a retail character. The Wabash lies in well settled territory and hauls a heavy tonnage of low grade freight. The last two are not only great trunk lines to the seaboard, but also tap the coal and iron fields. Much of their tonnage is consequently of low grade. The Pennsylvania enjoys a still further advantage, superadding a rich local traffic in manufactures and merchandise. As compared with its rival trunk line, the New York Central, it hauls relatively little grain; but, on the other hand, the New York Central has a much smaller coal and iron business. Some one has aptly characterized the difference between the two roads, describing the New York Central as "operating between good points, but not through a good country" so far as local business is concerned. On the one, through traffic is supplementary to local business, while on the other it is the reverse. The high density of trunk line traffic is such that about two-thirds of all the tonnage of the United States is transported east of the Mississippi and north of the Ohio river.

(To be continued.)

The German government maintains in the Chinese province of Shantung, which is its "sphere of influence" in China, a military force of 10 officers and 79 men, who are relieved from time to time. Heretofore they have gone by sea, but this year they went by railroad, over the Russian and Siberian railroads, the Chinese Eastern and the Southern Manchuria, for which the consent of three different foreign countries were required—Russia, Japan and China. The journey through Russian territory takes 25 days. Not only is time saved by going by rail, but it is cheaper.

*Vol. XLII., p. 273.

EARLY LOCOMOTIVE WORKS.

The pioneer work in the development of the locomotive appears to have been done almost entirely by the English-speaking people in England and America, and railroads were not built in continental Europe or much work done in building locomotives until they were fairly well developed and had taken on the main outlines of a successful type in the former countries. The history of locomotive building on the continent would be an interesting story, but we do not know of any book in the English language which records it. The development of early English locomotives is well described in Smiles' "Life of George Stephenson" and by J. G. Pangborn in his description of the locomotive models at the Columbian exposition. In the book recently published by Angus Sinclair we have a very complete account of the development of the early locomotive in the United States and incidentally of the early locomotive works and the men who were prominently connected with them. It also relates to the development of the locomotive on a number of American railroads and to the first master mechanics who were prominently connected with this history. All of this makes an interesting story from which we can obtain valuable facts, especially in regard to the exact dates when important improvements were made and when the numerous locomotive works were established.

Following the early period in the order of dates, we find that the Stockton & Darlington Railway was operated by Stephenson locomotives in 1825; and the first successful locomotive operated in the United States was the "Stourbridge Lion" at Honesdale, Pa., in 1829. Then followed the work of Phineas Davis and Ross Winans in the development of the "grasshopper" locomotive for the Baltimore & Ohio in 1830. The "John Bull" was imported from England and operated on the Camden & Amboy in 1831, and the "Old Ironsides" was built by Matthias W. Baldwin in 1832 for the Philadelphia, Germantown & Norristown. This date marks the establishment of the present Baldwin Locomotive Works. In 1834 Mr. Baldwin designed the locomotive "E. L. Miller," which was the elementary form of the American type with a 4-wheel truck and driving wheels behind the firebox. Phineas Davis was a watchmaker and Matthias Baldwin a jeweler, which illustrates the curious fact that a workman skilled in the manufacture of such small machinry can apply his knowledge to much larger and very different work.

As early as 1838 sixteen firms were building locomotives in the east, and in the decade 1851 to 1860 twelve firms were building locomotives in the west—principally in Ohio, about Cleveland and Cincinnati. One shop was at Chicago, one at Milwaukee, one at St. Louis, one at Detroit, and the most famous was the Cuyahoga works in Cleveland, which commenced building locomotives in 1850. The Norris works commenced building locomotives in Philadelphia soon after Mr. Baldwin, turning out the first one in 1832, eight in 1836 and 100 in 1854. William Norris obtained an international reputation on account of the successful performance of eight locomotives which he built for an English railroad, and he afterward established locomotive works in Vienna.

In 1838 Eastwick & Harrison built the "Gowan and Marx" American type 8-wheel engine, with 12½ x 18 in. cylinders, driving wheels 42 in. In 1840 one of these engines hauled 104 cars weighing 423 tons from Reading to Philadelphia. The success of this locomotive attracted the attention of foreign countries, and the Russian government induced Eastwick & Harrison to establish locomotive works in Russia and they abandoned their shops in the United States. Joseph Harrison, Jr., was the engineer of this firm, and he designed and patented the equalizers for driving wheels, one of the most useful of the early improvements on the locomotive.

The invention of the 4-wheel engine truck is credited to John B. Jervis, who used it on the Mohawk & Hudson in 1831. The "DeWitt Clinton," built at the West Point Foundry in 1831, was from designs of Mr. Jervis. The cylinders were 5½ x 16 in. The steam pressure carried at that time was 50 lbs. and the weight of the engine 4 tons. This engine is seen in the familiar picture of the old excursion train on the road between Albany and Schenectady.

The first locomotive works to be established in New England was that at the Lowell machine shops, and locomotives were built there as early as 1834. These locomotives had a grate area of 6.4 sq. ft., heating surface of 300 sq. ft., firebox 22 x 42, cylinders 11 x 16 in., drivers 5 ft., a total weight of 23,000 lbs., weight on drivers 14,500 lbs.

In 1839 Hinkley & Drury commenced building locomotives in Boston. Isaac Hinkley, of the firm, was a strict advocate of inside cylinders and crank axles, and this firm built engines with crank axles for 10 years, and the shop was afterward known as the Hinkley Locomotive Works.

In 1852 William Mason commenced building locomotives at Taunton, Mass. He had been a manufacturer of cotton machinery and was an ingenious mechanic. He had a well-developed artistic sense which he was able to apply to locomotive design with good effect. He did much to improve the appearance of the locomotive and obtained good effects by symmetrical outlines and graceful proportions rather than by brass trimmings and highly colored paint which were at that time depended upon for decoration. The design of the wedge and shoe for driving boxes is credited to Mr. Mason. In 1876 he exhibited the Walschaerts valve gear on a locomotive at the Centennial exposition. We are also indebted to New England for the diamond stack and the brick arch which were invented by George S. Griggs, master mechanic of the Boston & Providence, in 1845.

In New Jersey the Rogers works was established by Rogers, Ketchum & Grosvenor in 1835, and their first locomotive was the "Sandusky," with 11 x 16 in. cylinders. The first of the American type locomotives with coupled wheels was built by the Rogers works in 1844, and they were the first to build the wagon-top locomotive boiler in 1850. Reuben Wells, for 20 years superintendent of the Rogers works, served his apprenticeship under Lewis Kirk and James Millholland at Reading, Pa. John P. Laird was employed at these works when a young man, and in 1860 he was appointed superintendent of machinery for the Pennsylvania Railroad. He made improvemets in engine trucks and invented the double-bar guide and crosshead which bear his name.

The Brandt Locomotive Works was established as the New Jersey Locomotive Works about 1855, with John Brandt as superintendent and Zera Colburn as mechanical engineer. This works met with financial embarrassment in 1863, and D. B. Grant, a New York banker, secured the property and gave it his name. This company sent to the Paris exposition in 1867 a locomotive which was celebrated for its highly polished finish and German silver trimmings. Mr. Brandt did much to establish standard parts and interchangeability and to facilitate duplication, which was of great assistance to the early master mechanics.

Another locomotive works in Paterson, N. J., was that of Danforth, Cooke & Co., afterward the Cooke Locomotive Works, which was established in 1852. John Cooke, of this firm, was originally a patternmaker and a foreman at the Rogers works. The Trenton Locomotive Works commenced operation in 1853 and the superintendent was Isaac Dribbs, who was the first to be appointed in general charge of the locomotives on the Pennsylvania road. In 1857 this works built for the Lehigh Valley what is believed to be the first diamond freight truck, which type has since been so generally adopted.

The Schenectady Locomotive Works, established about 1853, is asociated with the name of Walter McQueen, who was superintendent and who had built locomotives at Albany as early as 1840.

The Brooks Locomotive Works at Dunkirk was not established until 1869. It was operated by H. G. Brooks, a locomotive engineer who has been promoted to the positions of master mechanic and superintendent of the Erie.

The Philadelphia & Reading is notable for the early work of James Millholland, who was appointed master of machinery of that road in 1848. He did an important work in connection with Ross Winans in developing the anthracite coal-burning firebox and boiler. He was the first to use a wide grate with firebox extending beyond the drivers, and also the first to place the firebox above the frame, this design being used by him in 1857. The subsequent invention of the Wootten boiler extending entirely over the drivers was no doubt influenced by the earlier work of Colburn and Millholland. Zera Colburn was born near Saratoga in 1832, was apprenticed to the Lowell machine shops and became one of the foremost expert mechanical draftsmen in the United States. He was an elegant and lucid writer, and for this reason adopted engineering journalism for his life work. He published "Colburn's Railway Advocate" and edited "London Engineering." His most important work was a book on locomotive engineering and the mechanism of railroads. The famous mathematician, Zera Colburn, was an uncle of this editor and engineer.

The Lehigh Valley was also prominent in locomotive development, as the first locomotive of the consolidation type was designed by Alexander Mitchell and built in 1866 by the Baldwin works. The Lehigh Valley was also peculiar in having built up to 1866 almost all of its locomotives at five different shops from as many different designs and patterns, the master mechanics at each place being in competition with each other in trying to build the best locomotive.

The early locomotives for the Pennsylvania were built by M. W. Baldwin, with cylinders 14 x 20 in., 72-in. drivers, and weight of 47,000 lbs. The first superintendent of motor power of this line was Enoch Lewis, who was appointed to this position in 1852, when the road was first extended from Philadelphia to Pittsburgh. Some of the earlier locomotives on this road were built by Norris and some by Winans. The Pennsylvania line was among the first to adopt steel rails in 1867 and the first to use steel fireboxes and steel tires.

The first locomotive used by the Chicago & North-Western—that is, on the Galena & Chicago Union Railway—was built by Baldwin in 1836 and brought west for service in 1848. In 1853 Scoville & Co. operated the Chicago Locomotive Works, a shop located at the corner of Canal and Van Buren streets, in Chicago, and they built seven locomotives for the Galena road. On the Illinois Central M. N. Forney was employed as a draftsman under Samuel J. Hayes, and it was here that he designed the type known as the Forney locomotive which has the engine frame extended back, forming a part of the tender frame, and this type of engine is still operated by the Illinois Central in its Chicago suburban service. In 1870 Mr. Forney was appointed assistant editor of the *Railroad Gazette*, which was then published in Chicago. The office of the *Railroad Gazette* was burned in the Chicago fire of 1871 and the business was then moved to New York.

The Pittsburgh Locomotive Works was organized by Andrew Carnegie in 1865, with Thatcher Perkins from the Baltimore & Ohio as the first superintendent and J. Snowden Bell the first draftsman.

The Richmond Locomotive Works was established in 1886 by William R. Trigg, and it was here that C. J. Mellin invented the intercepting valve used in the Richmond compound locomotive.

This rapid review of early locomotive building in America suggests a comparison of the size of one of those built 75 years ago with one recently constructed. Baldwin's "Old Ironsides" had two drivers and cylinders 9½ x 18 in., boiler 30 in. diameter with 72 tubes 7 ft. long. The total weight of the engine was 5½ net tons. The "Angus," built for the Erie, 1907, has 16 drivers, cylinders 25 and 39 x 28 in., 401 tubes 21 ft. long, and the total weight of the engine ready for service is 205 tons.

COLLISION AT CONTICH, BELGIUM.

BY LOUIS WEISSENBRUCH.

The accident at Contich, May 21, last,* on the state railroad, is the most serious that has ever occurred in Belgium. At Groenendael in 1889 there were 14 killed and 99 injured; at Cerous-Mousty in 1893, there were 21 killed and 113 injured, and at Forest-Midi in 1899, there were 23 killed and 219 injured. As Mr. Helleputte, the minister of railroads, stated in the Chamber of Representatives, all of these figures have been exceeded in that at Contich. On the day of the accident it was stated that 36 had been killed and 208 injured. But the latest reports show that the number of the killed has risen to 40, while 324 passengers were injured.

The cause of the accident is to be found in the temporary aberration of the signalman in charge of the Saxby interlocking apparatus in the tower at Contich. At this point there is a diverging junction.

For the past thirty years the main line has been equipped with a block system apparatus interlocked with the signals and this is still in use, though preparations have been begun to replace it with a Siemens & Halske apparatus of the latest design.† This work was being carried on at the same time as the replacement of all of the semaphores and the introduction of distant signals with electrically illuminated warnings for foggy weather. The new block system apparatus was in place, and was ready for the attachment of the parts that were to connect it with the signal levers. In order to do this it was necessary to entirely remove each one of the signal levers, bore two holes in the lever itself, extend the bracket of the stop for the latch towards the bottom, bore a hole in the support of the lever of the link and extend the opening in the foundation out to each end. In order to effect this last part of the operation, it was necessary, in each instance, to take down the lever for a certain time, and so do away with the interlocking of the Saxby apparatus. The average time required to perform this operation was only about two hours. It is possible that even this length of time could have been reduced if the levers had been made perfectly interchangeable. They could then have had one made ready in advance. But in the first patented apparatus made by Saxby, like that at Contich, the levers in a single machine were so different from each other that the work of replacing and adjusting a single lever with its link required more than half a day. The method used at Contich was, therefore, the most expeditious possible, though, because of a mistake in the work it lasted three hours instead of two. Viewed from the standpoint of its probable duration, the work ought to have been assembled in a shorter time than that often required by the repairmen of the signal department to make repairs on the Saxby apparatus. The work was done, then, in the usual way for such cases. The functions of the dismounted lever were assumed, in accordance with a common agreement between the signalman and the adjuster, by a man who was detailed for the work by the supervisor of track. This man, who was stationed at the foot of the tower, pulled the signal wire by means of a handle of cotton waste, fastened to the wire, each move being made in obedience to the directions of the towerman.

The work had been started the evening before and then taken up again on the day of the accident, May 21, at half-past five in the morning. At half-past six the lever [of the home signal] was taken down, and five or six trains passed without any delay. At 8:55 train No. 515 arrived from Antwerp, bound towards Lierre. After it had run in on the main siding, the signalman closed the home signal back of it, but forgot to

Railroad Gazette, May 25, pages 719, 745.

†For a resumé of the new signals of the Belgian State Ry., see the Bulletin of the International Railway Congress for April, 1907.

close the square disk distant signal (I), which, according to the regulations still in vogue in Belgium, must not be passed when at "danger." He also forgot to set the point lever in its normal position—that is for the main line.

At this instant train No. 226 arrived from Antwerp, bound for Brussels, due to stop at Contich (barracks) at 9:01. The towerman without thinking that his point lever was not in the right position, called out to set the signal at *i* for the passage of the train; and No. 226 came on and plunged into train No. 515 on side track No. 2.

This act of the towerman can only be explained on the basis of a temporary aberration, for he could see that the point lever, which otherwise was in perfect condition, was reversed, since it stood out alone (with the locking lever) from the line of other levers that were in their normal position. His act is, therefore, of the same nature as that of an engine driver who runs past a signal set at stop. It is, however, worse, for the signal was not a few hundred meters from him, but was immediately before his eyes in the cabin.

In giving the foregoing facts to the public, the minister of railroads added the following interesting remark on the subject: "We often hear the use of warning signals urged, and that, too, with good reason. They say that, in case of fog, the engineman may not see the signal. Some system should be used, which will enable the engineman to know that the signal is not open ('off') so that he will be warned and will not pass it.

"Based on the same principles there should be evolved some system of warning for points and switches that should be placed so as to notify all employes placed in charge of the manipulation of signals or gates.

"Yet, at Contich, the signalman had just such a warning before him, a true indicator which showed the position of his apparatus; still the accident occurred with all of its appalling consequences. Was it a case of forgetfulness, momentary distraction, aberration, who can say?"

A comparison with the Hall Road accident in England that occurred on February 27, 1905, in which there were twenty deaths, naturally suggests itself. The signalman left the points open leading into a siding on which he had just received a train. As a matter of fact he could not see the signal for the passage of a second train that was to continue on on the main line, and thought that the signals were out of order, in what must have been considered a case of temporary aberration, and so showed a flag that gave the train the right to proceed. The result was a frightful collision with the train on the siding.

At Contich the engineman noticed that he was being turned from the proper line some meters before reaching the switch, and made an immediate application of the Westinghouse high speed brake. But because of the speed and weight of the train, the shock was very great. Supposing that the speed of the train was 80 kilometers (49.6 miles) an hour, and that the action of the brake was complete throughout the whole length of the train three seconds after the engineman had moved the handle of the valve, the train would have had to have been stopped in a distance of 305 meters (1,000 ft.). Now, he required 404 meters (1,325 ft.) in order to make a normal stop. It is true that there had been a recent rain and that the rails were "greasy." On the other hand it appears to be equally probable that the speed was less than 80 kilometers an hour. In spite of this the rear end of the train for Lierre standing at a distance of 110 meters (350 ft.) from the switch, was reached and the last three cars filled with passengers, workmen, soldiers and pilgrims, were completely demolished.

Such was the accident in its unfortunate simplicity. We do not see how any administrative or judicial investigation (the official findings have not yet been published) can tell us any more. But it remains to say a few words regarding the discussion that the explanation of the minister gave rise to.

Several speakers in the Chamber of Representatives made special efforts to place the responsibility higher up than on the shoulders of the signalman as the direct and evident cause of the accident.

It was shown in particular that the chief station master, although notified in a general way of the work that was in hand, had not received notice of the time that the interlocking was to be disconnected, and so had not co-operated with the measures that had been taken, or given them his official approval. This fact has a certain interest from an administrative standpoint, as involving the question as to whether or not certain prescribed regulations had not been violated. But, from the standpoint of the public, and of the railroad manager, the principal point involved is to ascertain whether the precautions taken were good, and if not, what should have been done to avoid the accident.

Now, it is quite probable that, if the station master had been notified, he would not have approved of the arrangements made by the workmen. One critic in the Legislature cited Article 70 of Section IV. of the general regulations:

70. Malicious Manipulation.—It is positively forbidden to take any signal wire in the hand for the purpose of operating it.

Another speaker cited Article 353 of the block signal regulations.

"353. It is forbidden to take signal (block) wires in the hand. It is positively forbidden to take any operating wire in the hand for the purpose of working the signal (block) in case of the derangement of the apparatus (block system) under penalty of severe punishment."

The speakers were of the opinion that these regulations had been broken at Contich. They were evidently mistaken. These articles forbade playing tricks with the apparatus or maliciously or fraudulently taking the transmission wire in the hand. It evidently was not forbidden to operate the signal in that manner when the interlocking had been broken, nor to create an improvised lever, nor to replace the latter with an animated lever, that is to say with a man provided with a bunch of waste as was done at Contich. The whole question is as to whether this provisional operation was regularly organized. And it may be maintained that an animated lever is to be preferred to an improvised lever, because it requires the co-operation of two men who may be able to control each other. One of the critics, however, claims that if the station master had been notified he would have stopped all trains and have either given himself or had the assistant station master give a passing order to all enginemen, in accordance with Article 28, viz.:

"Formalities for passing a signal standing normally at stop in consequence of derangement or the absence of the signalman."

As the title indicates, this requires that, in case any derangement of the apparatus occurs unexpectedly, and unless the person in charge of the operation knows the cause or the man in charge of the apparatus can be called, such action shall be taken.

If the station master had applied this article of the regulation at Contich he would hardly have justified the necessity, for he would have introduced a great disturbance into the train service on a busy line. The accident would not have occurred at Contich, to be sure, but there is nothing to indicate that another accident might not have happened at some other point because of the congestion caused by the delays at the rear.

Furthermore, it is certain that in regard to this very matter it is not customary to act in this way every time there is any derangement of the Saxby apparatus which involves the disconnecting of a part of the interlocking apparatus for a space of two or three hours in order to make repairs.* The object

*The critics acknowledge that it is almost impossible for the station master at Contich to have placed himself at a distance of more than 250 meters (820 ft.) from the ticket office and have delivered a written order to the engineman of each train, that would have been obliged to pass the home signal.

of the interlocking is to guard against the results of the distraction of the signalman. But if he has received a special warning, and that is what was done at Contich, it is fair to demand that he should redouble his attention for the time being, especially if that time be short. A man who was following a road all of his life that bordered on a precipice and which was without a parapet would probably fall into it some day, but if there were to be a parapet in which there was only a short opening, of which he had been warned, the liability would be almost infinitely reduced; so much so that there would be little to fear.

Even when the posts and the interlocking are complete, it may be that inattention on the part of the signalman may send a train in on a siding already occupied. And at Contich the point levers giving access to track 1, adjacent to track 2, occupied by the train that was telescoped, were not interlocked, at the cabin controlling the branch. They were in the hands of another switchman (Post IV, see diagram), and there was nothing to prevent him from manipulating them unseasonably.

If the measures taken at Contich can be considered as in accord with current practice, it becomes a matter of no interest to know that the signalman responsible, according to the regulations, for the maintenance, oiling and minor repairs of the apparatus in charge of the station master, had neglected to advise him of the disconnection, though he was directly connected with him by telephone. It is of still less consequence whether the adjuster had neglected to assure himself that the signalman had advised his chief and still less whether the foreman machinist who passed that way the evening before had omitted to ascertain whether the adjuster had fulfilled this obligation, though all of these three employes were subjected to certain fixed penalties for their neglect in this particular.

But it has been carried still further in the Legislature. Mr. Verwagne claimed that it was the duty of the director of safety apparatus (or the chief inspector of the work that was in course of execution) "to have been personally on the ground."

While this might not have avoided the accident, it may be of some interest to railroad men to look into the arguments advanced by Mr. Verwagne and see what would be the result of direct intervention of parliament in railroad operating details.

The maintenance of the mechanical apparatus for the safety of the movement of trains on the Belgian state railroads is in reality not entrusted to the director of the safety apparatus, but to eleven directors of the groups of track and permanent way. Each of these groups includes about three sections and there are two adjusters for each section; or six adjusters for a group. Each of these employees, who are all selected men, are during every working day as important in their respective posts as was the one that was on duty at Contich at the moment of the accident. It is easily seen how expensive the organization would become if an engineer were to be made an adjunct to each one of these adjusters.

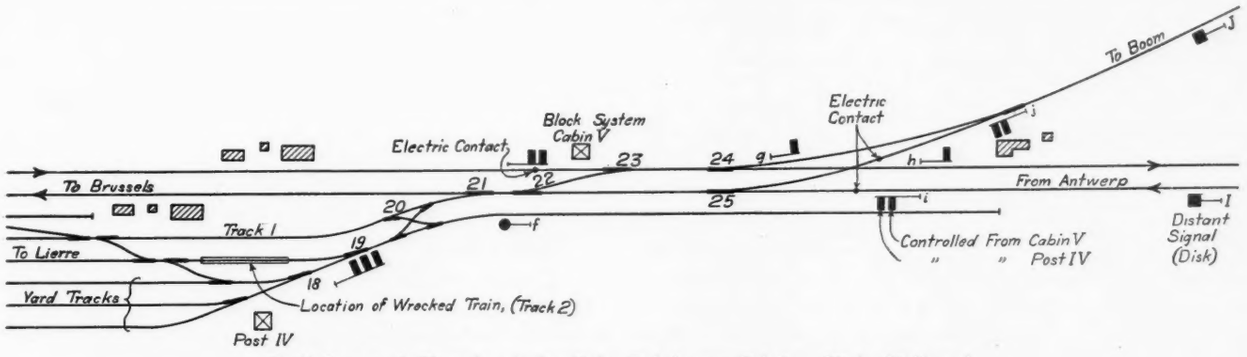
Furthermore, such an organization would be a very bad one inasmuch as the engineer would look on with folded arms at the manual work of the adjuster and the latter would lose all of his self-respect by reason of being watched at every step and of his knowledge that another was responsible for his every act.

The critics in the Legislature also went to the trouble of exhuming an old regulation dating away back in 1844, which is as follows:

"The engineers in charge of the service are responsible for every accident that may happen during the execution of any work because of the negligence of any of the employes."

If this article were to be interpreted as the members of parliament urged that it should be read, it would say that the director of the group of track and permanent way at Antwerp, under whose orders the signalman was employed who made the mistake which resulted in the Contich accident, was "responsible" for that accident! This conclusion would evidently be absurd. Furthermore, at the time when this regulation was made, the Belgian State Railway included only a few lines, perhaps 200 or 300 kilometers (124 to 186 miles).

Some speakers in the Chamber also called attention to the absence of a collision van that would have lessened the number of the victims. The minister replied that no instructions had ever been issued calling for the placing of such a van at the rear end of passenger trains. In the early days it was only shuttle trains that were placed between two such vans, and that was only done in order to avoid the necessity of switching and making up the train at each terminus. The first instruction on this subject is dated in 1865 and merely prescribes that a coach fitted with a screw brake shall be placed at the rear end of each train. The same question arose at the time of the Forth accident and the Belgian State Railways made an investigation then, on this general subject as to the railway practice in England, and on the Continent. Only the South Eastern and the London & Chatham replied that they prescribed the use of a brake van at the rear end of long trains. The absence of the collision van is therefore a matter of common practice.



Switches and Signals at Contich, Belgium—Belgian State Railroad.

Furthermore, there is nothing to prove that the existence of a collision van at the end of the train would have mitigated the severity of the accident at Contich. In fact, the train telescoped would have been still longer than it was, and the shock would have occurred sooner and would have been correspondingly more violent. If the van had contained a reservoir of gas it would have caused a fire.

Finally, one speaker urged the superiority of a shuttle, instead of a direct yard. [Meaning a yard with no facing points on high speed lines.] It is hardly necessary to reply to such a claim, for in the case of Contich, there was no yard, properly speaking, but merely a yard combined with a diverging branch track at a point of dense traffic. It will be easily understood how any arrangement for the backing of trains into a siding would cause endless delays to the forwarding of trains and block the main line in such a case.

MELTING SNOW AROUND SWITCHES.*

BY JAMES S. LANG, M.E., E.E.

Winter demands nerve racking energy on the part of railroad employees to insure safe and undelayed traffic. Snow and sleetstorms; water from leaky locomotive tanks, overflow from injector pipes on engines, drips from car heating piping, and water from train lavatories and kitchens, emptied into the switch and interlocking mechanism in the railroad yards to freeze render switches inoperative. This "water trouble" is one of the constant causes for delayed traffic during the winter months. During severe blizzards detector bars become frozen to the rail; the snow is turned to ice by dripping water from various sources and is pounded into the heel of the switches, and snow and ice work in around nuts on adjusting rods, having the same effect on switches as too tight adjustment.

Various schemes have been proposed to free the track and interlocking mechanism of snow and ice, but they all have the great disadvantage of necessitating an extensive and costly installation under and around the rails and switch mechanism. This fact alone has rendered them impracticable even if it were not necessary to remove such installations whenever it became necessary to tamp the ties or make other track repairs; also the metal fittings are short lived in railroad yards, due to the action of the acid from the sparks and cinders. Such installations are also liable to derangement, or even to be put entirely out of commission at the critical time of a blizzard, in case of a derailment which is more likely to occur at the time of a storm than at any other.

During the past year a new system of snow melting has been used at several of the large terminals. Its practicability has been demonstrated during the past three winters at one of the busiest terminals in the country, with the result that delays due to snow and sleet storms have been almost entirely eliminated.

An extremely low cost, both of installation and operation, is possible on account of the small amount of apparatus required in comparison to the number of switches protected. Instead of requiring piping or permanet apparatus for each switch, several switches are handled with no more apparatus than is necessary for one, and nothing that might in any way interfere with either the operation or the repair of switch or track is used. Even complicated and busy yards may be taken care of by the regular track and interlocking forces without any extra help whatever. The saving in operation by this method as compared with the usual method of hand cleaning will pay the entire cost of installation in a single large storm.

The melting of the snow or ice is effected by applying to it a flaming fluid which continues to burn while in the snow, melting and finally evaporating the greater portion of it. The character of the fluid is such that the flame is easily maintained regardless of high winds or drifting snow.

The fluid is applied by the regular track force by means of a safety distributing can, and the height and extent of the flame can be regulated with ease. No injury to track results, as the temperature of the rails is not raised to the usual summer heat, while the fluid, being a hydrocarbon, acts as a preservative of the ties. At night the light given off by the flame by rendering the forms of the men visible, lessens the danger of personal injury.

One of the first steps in installing this system is necessarily the installation of sufficient storage capacity for the fluid. This would vary in proportion to the number of switches which it was desired to keep operative, the average severity of the storms and the facilities for obtaining the fluid. The fluid is obtainable in the open market at from three to five cents a gallon, and may be obtained free of cost by railroads operating their own Pintsch gas plant.

*From a paper on Practical Snow Melting, read before the Railway Signal Association at Chicago, September 8.

At one plant, where this system has been in use, the tank, having a capacity of several thousand gallons, was connected with the compressed air used by the interlocking system, and when about 10 lbs. air pressure was admitted to the tank, the liquid was forced, through buried piping, to the several drawing outlets, located in various parts of the yard.

The storage arrangements may therefore vary from only a single 200 gallon iron drum, elevated upon blocking, where only a few switches are to be looked after, to a tank of several thousand gallon capacity feeding various lines of underground piping, in yards where the number of switches is large and the territory extensive, or where it is inconvenient or dangerous to cross tracks; or where there is no convenient nearby location for a tank.

The supply stations for the distribution of the fluid are provided with safety self-closing faucets, and drawing gages which enable the operator to readily tell, when the cans are being filled, how much fluid they contain, and how much is being used.

Below is given data derived from experience in a storm occurring during the past winter at one of the busiest yards. In comparison with the results obtained by the hydrocarbon system is given a careful estimate of corresponding cost of hand cleaning, based upon the experience of previous years and corresponding snowfall.

Hand Cleaning Yard Switches.

150 extra men, 24 hours each, 360 hours, @ 20c.	$720.00	
33 regular men (including foremen), 30 hours each.	181.70	
Meals: 150 men, 3 meals each, 450 meals; 33 regular men, 3 meals each, 99 meals; or a total of 549 meals, @ 20c.	109.80	
		$1,011.50

Using Snow Melting System.

No meals (men enabled to leave for meals).		
No extra men.		
Regular men, 20 hours each (duration of storm 24 hours, absent 4 hours for meals)	$121.80	
Hydrocarbon, 1,900 gallons @ 4c.	76.00	
Incidental charges, and rentals, which might regularly be charged to storm in question	66.60	
		$264.40
Saving effected in one storm		$747.10

This severe storm was taken care of without a single delay chargeable to snow, and switch failures were less than one per cent. of the usual number.

FOREIGN RAILROAD NOTES.

Herr Zemp, for 17 years at the head of the Railroad Department of the Swiss confederation, has resigned on account of illness. He is nearly 70. He has been in the Parliament for 37 years, and for two different years was President of the confederacy.

The Austrian Railroad Minister has approved a commission to report on the training school and others, which should be adapted the better to qualify for the lower end medium positions in the railroad service. Men who have worked up from the lower grades, or such as have intimate association with the men of these grades, are selected for this commission, and representatives of the various employees' organizations are to be consulted.

The Italian members of Parliament, of both houses, have hitherto had the right to take an unlimited number of tickets for themselves and families on the State Railroads at a discount of 40 to 60 per cent. from the regular fares, according to distance. By a new law, each one will have instead 12-trip passes first class and six second class, to and from Rome, which may be used only by himself and members of his family. Newspaper men, who had had a yearly free pass for themselves and all members of their families, hereafter are to be limited to four tickets at a reduction of 75 per cent. for each journalist, and one ticket at a discount of 40 to 60 per cent. for the family.

MECHANICAL DEFECTS IN RAILS.*

BY J. P. SNOW,
Bridge Engineer, Boston & Maine.

Mr. Howard has shown us that he finds evidence of unsoundness in all of the rails that he has examined. Some of these rails have, nevertheless, done magnificent service. This demonstrates that when conditions are favorable, either by accident or by intelligent control, the defects unavoidable in our present rail-making processes can be tolerated without undue risk.

I have heretofore discussed the three types of defects named above before other associations, but I wish here to extend what I said at our last annual meeting and to put on record my later convictions on the subject.

White streaks generally run into fissures if followed far enough. They do not extend very deep, generally not over ⅛ in. and they occur at different depths sometimes at the surface, generally a little ways inside the surface. They occupy the zone of the ordinary gas-holes that occur so generally in ingots. Their plane is generally parallel to the axis of the rolls; that is, perpendicular to the surface of the base and top of head and parallel to the surface of the web and sides of head. On the fishing surface of head and base the plane of the seams is dragged by the rolls into positions practically parallel to the surface. The fissures accompanying this type of seams are very straight and they frequently have a granular appearance as though they had been weakly stuck together before rupture, like soldered surfaces. I attribute these seams and fissures to gas bubbles in the plastic steel of the ingots, and from this supposed origin I call them gas-seams.

Gas-holes or blow-holes, as called by some, have been discussed by many metallurgists, notably by Prof. H. M. Howe and Mr. E. Von Maltitz before the Am. Inst. of Mining Engineers. I commend the paper on "Blow-Holes in Steel Ingots" by the latter author to all interested in this subject. (Inst. Mining Engineers, Toronto meeting, 1907.) Our member, Robert Job, illustrates these seams in a paper before the New York R. R. Club, November, 1906, and they show on many lantern slides prepared by Mr. Howard. If these gas-holes are deep-seated in the ingot, so that the seams will be from ⅛ to ¼ in. inside the surface of the finished rail they do not seem to be of vital significance. They appear to form at the junction of the columnar crystalline shell of the ingot and its amorphous central core. Proper means for deoxidizing and quieting the steel coupled with moderately slow teeming to the molds has the effect of decreasing the number of gas-holes and causing them to be deep-seated instead of near the surface.

Rolling-flaws are actual figures in the surface of the rail. They are generally somewhat crooked and their planes are frequently inclined to the normal to the surface. Their sides are generally fluted and look bluish like mill scale. They are frequently very minute, but are sometimes easily visible on a new rail as a distinct mark several feet long.

In all of the crescent base breaks that I have examined, including those occurring in service and those produced artificially, it has always been possible to detect the longitudinal seam from which the break started. In the great majority of cases the seam has been of the class that I call rolling-flaws. Most of the rest have been gas seams on the surface.

These flaws appear to me to be the result of checks, cracks or tears in the skin of the ingot or bloom, such as Captain Hunt told us about at our 1907 convention. I believe this class of defects to be responsible for more broken rails than all other classes combined. Their remedy is obvious.

Inclusions of manganese salts, called slag inclusions by Dr. P. H. Dudley and others, are very common and very fatal when near the surface of the head. This feature was well discussed and illustrated in the discussion last year by Dr. Dudley. Manganese sulphide in particular is very brittle and is probably the cause of most of the failures from split heads. On the other hand, my observation has failed to indicate that these inclusions have very much to do with base breaks, the flaw from which the break starts being, with very few exceptions indeed, a smooth seam face instead of a fracture. Dr. Dudley and Mr. Maltitz show that by adding the spiegle when the bath is hot and allowing sufficient time for the reactions to complete themselves and the resulting salts to rise into the cinder before the metal is teemed into the ingot molds, the danger from these inclusions will be lessened. It stands to reason that if the deoxidizing agent is added to the more or less cooled bath in the ladle that the reactions will be sluggish and that nodules of oxides, silicates and sulphides will be caught in the solidifying mass in the ingot, and when rolled will be drawn into seams, such as we see in split heads and the like.

A fourth type of unsoundness is due to segregation. This leads to crushing of the head, flow of metal and rapid wear rather than to absolute breakage. It can be controlled to some extent, according to Professor Howe, but it is inevitable to a greater or less extent when steel passes from a liquid to a solid state. Segregated material in the head of a rail especially if near the surface, is very objectionable, but if confined to the base will lead to but little trouble. Two ways of attaining this end are open, viz., by throwing the ingots down before freezing is complete and controlling the turns so that the top of the ingot, as it lies in the soaking furnace, shall be formed into the base of the rail, and, second, by rolling the ingot to a slab about 7 in. by 15 in. and splitting it at the last pass by cutting disks or otherwise, and rolling each billet into rails in such a way that the base shall be formed from what was the central part of the slab.

The rails examined by Mr. Howard and those that I have opened up with a hammer show excellent metal where sound. The deleterious effects of improper heat treatment, *after* the metal has solidified, do not seem to be in evidence to an important extent. In fact, I believe that our recent requirements of shrinkage for heavy rails of the A. S. C. E. pattern are inconsistent and all wrong. It is unsound steel that we should guard against. Dry air for the converter blast and proper deoxidizing and careful teeming will do much towards keeping gas-holes deep-seated and preventing slag inclusions; reasonable treatment in the rolls will prevent rolling flaws; the ever-present segregation can be made harmless by confining its location to the base and web of the rails; and all of these requirements can be covered without decreasing the output of a mill if the plant is built and organized with these points in view. Moreover, more of the melt will finish as No. 1 rails than under present methods.

I believe the investigations that Mr. Howard has started should go on. We need examinations of rails rolled under rational regulations of the recarburizing process, as, for instance, those made under Dr. P. H. Dudley's specification. We want examinations of open-hearth rails. We need to have the imperfections of each of these classes compared with those of the ordinary Bessemer rail of to-day, and we want all kinds of rails available, tested for rolling flaws. We want the scoring of the base that results from the higher speed of the edge of the roll over that of the rail investigated, to see if its effect is deep-seated. We want the effects of the straightening gag fully explored, and we want these features photographed, discussed and correlated so that they can be fully understood. We want blooms and cobbles examined to find, if possible, the origin of these various defects, and we want ingots opened up in order to study the various phenomena of cooling. Especially we should have a quarter of an ingot opened on the diagonal to show the conditions of columnar crystals and entangled gas-holes at the corner where crystals from two sides

*Discussion of Mr. Howard's paper, presented at the convention of the American Society for Testing Materials.

interfere. The difference in this feature between ingots with square and well rounded corners should be observed.

It is possible that shelly corners of the rail may be due in large measure to the conditions caused by the corners of ingots being too nearly square. We want the chemistry of the streaks and segregated portions thoroughly examined, and we want all this done by disinterested and unbiased parties, who can draw conclusions that may lead to improved manufacture as well as to means of testing, so that consumers may test for soundness in addition to the present test for absence of brittleness.

ANTI-FRICTION SIDE BEARINGS.

BY A. STUCKI.

The committee on Side Bearings and Center Plates for Freight and Passenger Cars, at the last M. C. B. convention in Atlantic City, approved the principle of anti-friction bearings as being beneficial to the car, and points out that thereby the flange wear will be reduced, the probability of derailments lessened and the danger from broken wheels diminished. To what extent the friction is to be reduced could not, however, be stated, inasmuch as the existing devices vary greatly in regard to this feature. In fact, some of them scarcely reduce the friction to one-half of that of solid side bearings, while others are nearly frictionless in the word's truest meaning, and the committee contents itself by saying that the friction should be reduced as much as possible.

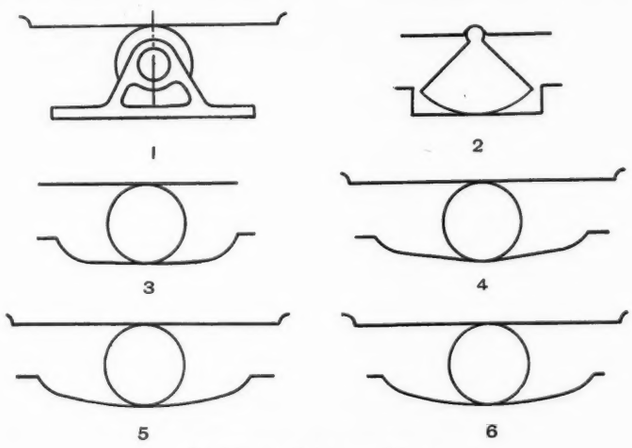
Much less could the committee go into the different constructions up to date. Not only do the details differ in every instance, but even the underlying principles are often of a directly opposite nature, and certain to produce side bearings, whose operations will not bear much similarity. We shall have to judge for ourselves which is the right course to pursue. The committee points out that the construction should insure simplicity and durability.

After being passed upon favorably by the above-mentioned committee, little more need be said in favor of anti-friction side bearings, but the writer cannot ignore some facts which were brought out by Mr. Bush before the Chicago Railway Club in January, 1908. Mr. L. H. Turner, Superintendent of Motive Power of the Pittsburgh & Lake Erie, has for years foreseen the importance of a freely swiveling truck, and equipped some 8,600 cars with frictionless center and side bearings, some as early as 1901, while 6,961 cars had yet the ordinary solid bearings. For a period of three years, ending May 31, 1907, a record was kept. In all, 22,806 wheels were removed, 19,608 or 86 per cent. of which had to be taken out on account of worn flanges, as follows: 472, or 2.1 per cent., from the anti-friction bearing cars; 8,926, or 39.2 per cent., from the solid side bearing cars of their own equipment, and 10,207, or 44.8 per cent., from foreign cars. These figures would undoubtedly vary greatly on different roads, as do the conditions of the service, but none the less the difference in favor of the anti-friction bearings is so evident that there can be no doubt in the matter.

Mr. Turner further states before the Pittsburgh Railway Club, in January, 1908, that the pull necessary to move a train on a curve is reduced 10 per cent. when the cars are equipped with anti-friction bearings. Such a figure affects directly the coal pile, the motive power and the earning power of a road. Applying such a saving to the entire motive power would lead to figures which, even in a very short period, would pay for the additional outlay in the car equipment many times over. It is, of course, understood that in this case both the side bearings and the center bearings were of the anti-friction type, but on account of the large lever arm, on which the side bearing acts, the benefit is derived mostly from it, and this article will deal principally with the side bearings.

The friction should be reduced to zero if possible. In pivoted bearings, as indicated in Fig. 1, this is impossible. Owing to the fact that at times by far the larger portion of the total load comes upon the side bearing, a very large trunnion is required. On the other hand, the space between the two bolsters is usually limited, excluding rollers above 3 in. or 4 in. in diameter, which will give a ratio of trunnion to roller of about 1:2, which means that about one-half of the original friction will be done away with. Conditions in this respect are very much improved by using a small pivot and a segment, as indicated by Fig. 2, while in Fig. 3, where a free traveling roller is shown, all the friction is removed. In an article of this kind it is not intended to consider the negligibly small amount of friction due to roughness of the rollers and their tracks. Innumerable combinations have been attempted by using either of these three elements, but whatever these combinations may be, the amount of friction will always remain the same as in the underlying elements.

As mentioned above, even the most important operative features differ greatly in the different anti-friction side bearings of to-day. For instance, some exert a constant pressure on the truck when on a curve, tending to swing it back into a straight line with the car, while in others the truck is swiveled around its center plate only when compelled to do so by



Forms of Side Bearings.

the rail and is not influenced by the side bearings. In approaching a curve at high speed the flange of the front wheel on the outside rail is subjected to many strains, among which are the following:

(a) The centrifugal force, tending to force car and truck bodily outward.

(b) The swiveling force acting to turn the truck around its center. This force is greatest with a heavy truck, especially if the masses are far from the center plate. This shows that light axles, wheels and journal boxes not only mean less dead weight and more revenue, but also a smaller swiveling force.

(c) The wedging force between the wheel flange and the rail, the point of contact on the tread forming the fulcrum and the advanced flange forming the point of application of the force.

(d) The pinching force, due to the truck frame being out of square.

(e) The friction of the side bearing, tending to retain the truck in the same position as to center line of car. This force is very great with solid side bearings, inasmuch as the largest portion of the load comes upon the bearings tending to lock the truck and car.

(f) An additional centering force, tending to keep the truck in line with the supported car, in cases of a truck centering side bearings being used. This force varies with the angle of inclination on the side bearings. In some bearings, such as shown in Fig. 4, it is the same, regardless of the curvature of the truck casting, or greater as the curvature increases, in

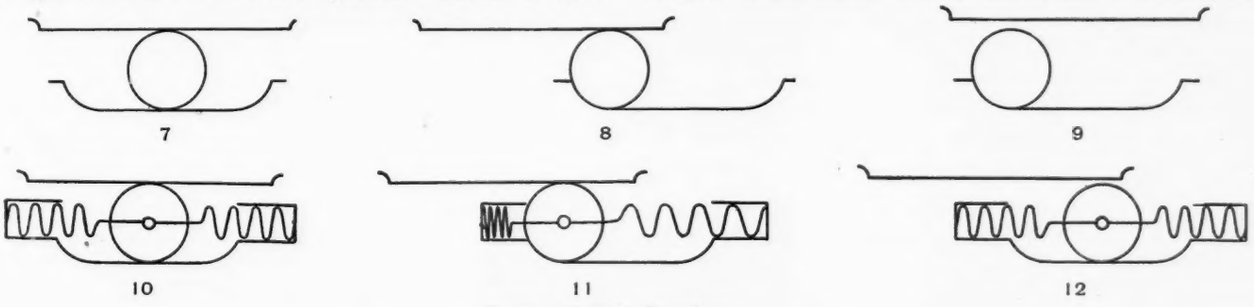
bearings as shown in Figs. 5 and 6. Eliminating all the forces which are not directly affected by the action of the side bearing, we have as lateral forces on the wheel flange:

With	Approaching a curve.	On a curve.	Approaching a straight track.
Truck centering side bearing....	e + f	f	e — f
Neutral side bearing	e	o	e

This would indicate that a neutral side bearing will result in more equal and smaller lateral forces on the wheel flanges than is the case with the truck centering feature, and, in fact, the discussion on Mr. Brush's paper, above mentioned, has brought out conclusively that a truck with reduced resistance to swiveling will right itself on a tangent especially with the steeper taper on the wheel tread.

It must be remembered that the elevation of the outside rails on curves can accommodate one speed only. If the train runs faster than this speed the outside side bearings will close, while if the train runs slower the inside side bearings will close; therefore, the opening and closing of the bolsters has no relation to the curvature of the track or to the swiveling motion between the two bolsters. With a pivoted bearing, Fig. 1, there will be no trouble on this account. The roller remains stationary on one bolster and is always in position to roll on its mate. This latter bearing, of course, will have to be made sufficiently long to be able to accommodate the total motion of the bolsters.

Quite different is the case with free rolling side bearings, be it a segment or a roller. This is best understood by referring to Figs. 7, 8 and 9. The central position is shown in Fig. 7.



Forms of Side Bearings.

If the body bolster is moved to the left, as in Fig. 8, and then raised and moved to the right, Fig. 9, the roller is locked against a subsequent left-hand movement, and sliding will have to take place just the same as though we had no anti-friction bearing. Such sliding is detrimental in more than one way. Not only will it cause friction, but whenever the bearing surfaces are small, as with free rolling bearings, they will not stand the heavy wear for any length of time. Often caps are mounted on the rollers or the segments and travel with them. These form a large enough surface of contact with the other bearings, so that at least one of these objections—that of rapid wear—is overcome.

Some anti-friction bearings are made to be self-centering when the bolsters separate. This is done by gravity, in Figs. 4 and 5, or often by the use of springs, as in Figs. 10 to 13. Here, also, the locking of the two bearings can and will take place. In Fig. 10 all the parts are located centrally. In Fig. 11, the body bolster has moved to the left. When the bolsters separate the roller bearing becomes central, Fig. 12. When the body bolster is closed again and moved to the right, before it can complete its stroke, the bearing will be locked and must slide, Fig. 13.

The proper way to guard against such locking is to construct the movable parts of the side bearings in such a way that they will travel with the bolster, whether it is touching or whether it is off. Then, no matter what takes place, the side bearing will be found in the proper place ready to carry the bolster without causing friction, without locking, without grinding.

Coming now to the question of construction, the combinations vary so much from each other and are so numerous that it will be impossible to dwell upon this question here. Only the most important point, simplicity, may be mentioned here again. Simplicity is essential in any car detail, but in this case more so on account of the severe service and the motion present. The side bearing is actually the connecting link between the car and truck, and if this link is not performing properly, both rolling stock and motive power will be suffering unnecessarily.

Summing up what has been said: an anti-friction side bearing should be free rolling; should travel with the bolsters, whether closed or apart; should be neutral in regard to the swinging of the truck, and should be of the very simplest and most durable construction.

NORWEGIAN IRON.

The recently opened Ofoten Railroad in Sweden and Norway north of the polar circle, built to carry iron ore from a Swedish Mesabe to an ice-free port in Norway, Narvik, which has been equipped with all the Yankee notions for transferring ore from railroad to vessel, has had some of the transformation effects familiar on our frontiers, changing a wilderness into a populace and busy community. A mountain of iron at a place called Kiruna was investigated by a Swedish government commission as long ago as 1736, and 30 years later ore from it was hauled by teams of reindeer to furnaces further south. It is estimated that it contains 250 millions of tons of ore above the level of an adjacent lake, and borings have found the ore to a depth of 1,000 ft. below that level. A few years ago there were only a few miserable huts of Lapps and Finns at Kiruna. Now it is a town of 7,000 inhabitants, with electric street railroads and electric lighting, for which latter there is no use in summer, however, for the sun does not set. There are no trees but birches. Barley is cultivated and cut for hay, as it does not ripen. The Kiruna ore field is less known than that of Gellivara, on the same railroad. These fields at present ship 1,500,000 tons to Narvik, and are expected to increase their output 400,000 tons per year until they turn out 3,300,000 tons a year, which is the estimated maximum capacity of the railroad. The larger part of the ore goes to Germany, but all western European ports are easily reached by it.

The German locomotive works are still fully occupied, but chiefly with orders for State Railroads made when they were not able to carry promptly all the traffic offered. These orders will be executed by April of next year, when an anxious time is looked for, the home demand being fully satisfied and the foreign requirements not nearly so great as in recent years, and the American works bidding so low for them that contracts at prices which will pay cost can hardly be made. The American works are taking the orders for South America, Japan, etc., of which German works formerly got a share. Likewise the demand for locomotives by iron works, mines, etc., has fallen off greatly. The State Railroads cannot require more than half the capacity of the German locomotive works.

General News Section.

The North Carolina Car Service Association, with office at Raleigh, is now the North Carolina Demurrage Bureau.

The Yazoo & Mississippi Valley is putting up a telephone wire throughout the length of its line, to be used as a train wire.

At Portland, Ore., on September 4, a suit was begun by the Federal government to recover lands granted the Oregon & California Railroad, controlled by the Southern Pacific, the land being valued at over $40,000,000. The suit is based on the alleged failure of the railroad company to live up to the terms of the grant.

The Chicago, Milwaukee & St. Paul since September 1 has been running regular passenger trains on its Pacific Coast extension as far west as Lombard, Mont., and freight trains as far west as Butte, Mont. Lombard is about 90 miles east of Butte. Passenger service will probably be extended to Butte on October 1. Sleeping cars are being run from St. Paul to Miles City, Mont., and this service will be extended to Butte when the line is opened to that point for passengers.

According to a press despatch from Winnipeg, September 7, the Canadian Pacific has so far agreed with its striking shopmen as to put them to work, this week, in their old positions, at the rates of pay set by the board of conciliation a few weeks ago; this action being taken pending investigation, by a second board, of certain points still in dispute. Within the past few weeks the company has engaged considerable numbers of new men to take the places of strikers, and it is said that 200 mechanics are to arrive from England this week.

W. T. Canada, chief of the secret service of the Union Pacific, says that the people of the west have no cause for alarm concerning train robbers. "At this time of the year we are always prepared to protect our trains. In addition to guards on all trains, the Union Pacific is still maintaining its equipment for the pursuit and capture of highwaymen whether successful or not. It consists of a car of well-bred, strong and fast horses, which can be loaded at a moment's notice. This car, with a caboose stored with saddles, bridles, camp outfit, arms and ammunition, make up a special train, which can be started for the scene of a hold-up almost immediately upon the news reaching headquarters."—*Exchange.*

New York Subways.

About $55,000,000 has been spent by the City of New York for subway construction, according to figures sent to the Department of Taxes and Assessment by the New York Public Service Commission. The amount is divided as follows:

Contract No. 1, which is the present subway from City Hall to its northern termini, $48,017,375.

Contract No. 2, which is the present subway from City Hall through Brooklyn to the Long Island station at Flatbush avenue, $3,692,382.

On the Manhattan portion of the Brooklyn loop lines now under construction through Centre street, and the Delancey street extension, $3,093,187.

The grand total up to August 31, 1908, is $54,802,944.

Proposed Enlargement of Canadian Government Railroad System.

The Canadian Minister of Railways has nominated a commission consisting of E. Tiffin, General Traffic Manager of the Intercolonial; D. A. Storey, General Freight Agent of the same road, and U. A. Bowden, Engineer of the Department of Railways and Canals, to inquire into the equipment, conditions and general business outlook of the various lateral railroads which connect with the Intercolonial (Government) railroad in Nova Scotia, New Brunswick and Quebec. The question of acquiring, either by purchase or lease, a number of these lines will then be considered. It is proposed that the Government shall take over those which it is found can be worked in connection with the Intercolonial with benefit to that road and to the country through which it operates.

Market Inactive.

The New York *Times* reports that an effort is being made by the New York, New Haven & Hartford to purchase the Newport & Wickford Steamboat & Railroad Company, which operates a railroad three miles long, which, with the boat connection, makes a line between Wickford station and Newport. The same newspaper says that there is opposition to the sale and intimates that the big company may have trouble in getting possession. This recalls an earlier incident in New England railroad history. If we are not mistaken, it was in the administration of President Clark. That gentleman wanted to buy for the great road the little branch line that runs from Kingston over to Narragansett Pier, eight miles. It was built and owned by Rowland G. Hazard, the rich and independent manufacturer of the latter place. Accordingly Mr. Clark wrote Mr. Hazard and asked him what he would take for his road.

Mr. Hazard replied promptly that he didn't care to sell his road, adding: "What will you take for yours?"—*Hartford Courant.*

Commissioner Bassett in Europe.

Commissioner Edward M. Bassett of the New York State Public Service Commission, First District, has lately returned from Europe, where he inspected the transportation facilities of London, Paris, Berlin and Vienna, and the daily papers report his observations. Among other things he says: "No other city has a rapid transit subway that can carry so many people in a given time as the New York subway. This is because our plan of express and local tracks is almost unique. Berlin has found that elevated railroads can be made almost noiseless and of such solid and beautiful appearance that abutting property is not damaged. The track is stone ballasted. Shade trees in the suburbs are so placed as to assist in beautification and the stations are of masonry and handsome. Their cars are lighter than ours and the tracks and motors have been made so carefully that they are almost noiseless. In the subway portions of the railroad no such amount of heat is generated as in ours, partly because of the lightness of the cars and partly owing to the care with which the operators have been trained in the use of the electric current.

"In Paris the city owns the subways, which are operated by a company under a thirty-five year privilege. Vienna has an admirable subway, which when electrically operated and more largely patronized will become valuable, but Vienna has been purchasing other public utilities at such a rapid rate that the city has no money at this time to perfect the subways.

"In London all of the underground roads are owned by companies. The old London Underground is no longer operated by steam but by electricity. It is, however, so cluttered up by a multitude of suburban branches that its operation is slow. This road, as well as the Staatbahn at Berlin, shows that a strictly urban rapid transit line cannot be used for both urban and long distance trains. Switches, crossovers and variety of destinations make them perform both functions poorly.

"The three new lines in London called the Yerkes tubes do not pay. It looks as though, from a financial point of view, some or all of them were premature. Automobile omnibuses have been taking business from these roads as well as from others. The new London subways are tube tunnels far below the surface of the streets, but it turns out that the cost of running elevators at the stations is about 5 per cent. of the gross income, a heavy burden. The tube tracks are smoother and better laid than our subway tracks; the cars although of metal are lighter; the running gear is better made, so that the noise and vibration are less than here, and there is no apparent generation of heat.

"The roadbeds and the rolling stock of the street railroads in the principal cities of England and Germany are superior to those of this country. Electric and other surface cars run almost noiselessly, handsome shelters are provided at transfer

points, and when overhead wires are used they are always suspended from ornamental poles. The motormen are trained to make quiet stops and starts; the safety devices, such as fenders and wheel guards, are far in advance of those used here.

"No other city has its business streets so crowded with trucks as New York city. Most of the large cities of Europe are approachable by railroads on all sides, each locality has its railroad freight station and all goods going to that locality are shipped to that station. There is no such constant and erroneous transportation of freight across the city and through the business streets as there is here."

Expert Accountants Wanted.

The Federal Civil Service Commission announces examinations, October 8 and 9, in prominent cities throughout the country, for candidates for the position of Examiner of Accounts, under the Interstate Commerce Commission. These men are to be paid from $1,800 to $3,000 yearly. About 75 are wanted, but thus far only a few qualified men have asked to be examined, and therefore the examinations scheduled to be held September 3, have been postponed to the date above mentioned. The work to be done by examiners is to be divided into the following departments of common-carrier accounting:

1. Steam roads: (*a*) General auditing; (*b*) Disbursements; (*c*) Freight; (*d*) Passenger; (*e*) Claims.
2. Electric railways.
3. Express service.
4. Steamship service.
5. Other common carriers service.

The examination will consist of the subjects mentioned below, weighted as indicated:

Subjects.	Weight.
1. Commercial and railway geography	5
2. Arithmetic	5
3. Abstracting (a test in condensing a statement of about 400 words into a brief, concise and accurate abstract of 150 words or less)	5
4. Practical questions in general accounting and statistics	15
5. Practical questions in accounting of railway and other common carrier service	25
6. Thesis on a transportation topic	15
7. General education, training and experience	10
8. Accounting and other technical experience along lines connected with railway and other common-carrier service	20
Total	100

The first six subjects will be given in the examination room and will require at least two days. Age limits, 23 to 48 years on the date of the examination. Only experienced men will be encouraged and evidence of experience must be submitted in a sworn statement. Applicants should apply to the United States Civil Service Commission, Washington, for application Form 304. Applications must be filed with the Commission at Washington by September 28.

The Station Agent and the Public.*

The position of agent is a very important one. You gentlemen handle the entire business of the railroads. Every dollar that we earn is handled through your office. In the State of Illinois we have 417 industrial corporations that employ expert traffic managers to look after their railroad service. Most of these men formerly were employed by railroads. These gentlemen make a specialty of rates and service on from one to three commodities and devote their entire efforts to obtaining the best possible service at the lowest price. These industries keep a detailed record of the movement and service afforded each individual shipment, the small shipper or receiver of freight is equally anxious for prompt and efficient service and must receive the same attention. It is true that frequently unreasonable demands and requests are made on you. * * * In winter the public moves its traffic by team during daylight hours, 8 a. m. to 4 p. m.—eight hours out of 24—and demands increased free demurrage time, whereas the shipper who is obliged to wait for cars (that are detained by the consignee) demands damages in the shape of reciprocal demurrage. In meeting these conditions, it is well to explain and make known our position. Shippers demand that we furnish our cars to load for distant points on foreign roads where we lose possession of them, the foreign roads holding and using our cars locally as long as desired. The average shipper and consignee does not understand and consequently cannot appreciate the difficulties we labor under, and the company must depend upon you, gentlemen, to make it known to them, not with a view of finding fault, but in the same friendly manner that shippers make known their conditions to us.

If a patron asks you what train connections he can make with other roads, figure it out for him, and, if necessary, use the wire to get it for him. If a shipper asks you why it is that the rate on his hay or his live stock is 25 cents per hundred, whereas the rate to the coal or lumber dealer is 5 cents or 10 cents between the same points, reason it out with him; show him where coal loads 50 tons to the car and live stock only 10 tons; further, that live stock is moved in fast trains hauling less than 20 per cent. as many revenue tons as coal trains. The public are not informed on such matters, and if you are patient and careful in explaining, you make a friend to yourself as well as to the company. I have attended quite a number of investigations made by the different State legislatures, the State and Federal commissions, and firmly believe these gentlemen aim to do what is just and fair, but they receive information on but one side of the case—that of the public—and their opinions are formed accordingly. Bear in mind at all times that a complaint from a patron shipping one car a year is as important as a complaint from a shipper giving us a hundred cars, and that the small shipper has an equal influence in any organization of which he is a member. If you, by giving him facts, convince him that we are doing our best to protect his interests, you will find that he will be our friend and co-operate with us. If the local agents will get together with the shippers and discuss their grievances carefully, I am satisfied that eight out of ten cases now brought before the commissions and legislatures could be disposed of in your conferences and never reach the commission. The average shipper is fair and wants only fair treatment, and when he is shown that he is receiving fair treatment he will be satisfied.

*Extracts from an address by J. M. Daly, car accountant, Illinois Central Railroad, at a meeting of the Association of Station Agents of the Freeport Division of the Illinois Central, at Mendota, Ill., August 15, 1908.

German Labor Unions.

German railroad men are not well organized on a trade union basis; there exist some unions, but their membership consists largely of workmen employed in the repair shops of the government railroads. The principal cause of this state of affairs is that the men engaged in the movement of trains are deprived of the right of combination. Section 152 of the German industrial code legalizes combinations and agreements of craftsmen and industrial employees for the purpose of procuring better wages or conditions of work. Certain classes of workmen are excepted from the provisions of this law, however, and among them are railroad employees, who are held by the government not to be entitled to the privilege of organizing. The Prussian industrial code, Section 182, contains a strict prohibition against agreements for the purpose of stopping or delaying work; this law names railroad service as among the undertakings to which it applies.

The trade unions of railroad employees in Germany may be divided into two groups: (1) Those observing religious and political neutrality; (2) the Christian Railroadmen's Union.

The first named group comprises two unions only: The Union of German Railroadmen (Verband deutscher Eisenbahner), with headquarters at Hamburg, is affiliated with the General Federation of Trade Unions of Germany, but the statistical reports of the Federation contain no data concerning this union. The membership of the union is very small. Its official journal is entitled *Weckruf der Eisenbahner.*

The other neutral organization is the Southern German Railroadmen's Union (Suddentscher Eisenbahnerverband), established in 1903; its membership decreased from 8,000 in 1904 to 7,587 in 1906; in 1906 the membership increased again to 9,153. There are no figures available concerning the financial transactions of the union. It has its own official journal, the *Suddentsche Eisenbahner-Zeitung.*

The second group consists of the following unions: Trier Union of German Railroad Mechanics and Workmen (Trierer Verband deutscher Eisenbahn-Flandwerker und Arbeiter), founded in 1894; Bavarian Railroadmen's Union (Bayerscher Eisenbahnerverband), founded in 1896; Railroadmen's Union

of Baden (Badischer Eisenbahnerverband), founded in 1898; Union of Railroadmen and Steamship Servants of Wurtemburg (Verband wuertembergischer Eisenbahner und Dampfschiffbediensteter), founded in 1898. The membership, annual income and expenditure of the four unions in 1906 are shown in the following table:

Name of union.	Members, Dec., 1906.	Income, marks.	Expenditure, marks.
Trier Union of Railroad Mechanics.	35,121	127,312	158,698
Bavarian Railroadmen's Union.....	22,155	221,730	129,381
Railroadmen's Union of Baden.....	10,125	18,000	15,000
Union of Railroadmen of Wurtemb'rg	7,589	30,099	19,250

During the year 1906 the Bavarian Union expended for certain purposes: Official journal, 32,484 marks; organizing, 2,330 marks; sick benefit, 1,306 marks; death benefit, 59,251 marks; contribution to the Federation of Christian Trade Unions, 400 marks; management and miscellaneous expense, 33,610 marks. There are no statements at hand showing the distribution of the expenses of the other unions.

Besides the unions named above there are in existence, a society of railroad officials, an association of locomotive engineers and a federation of Prussian and Hessian railroad employees, societies, consisting of more than 300 local societies. But these organizations cannot be regarded as trade unions; they are friendly societies under strict control of the railroad authorities.—*Locomotive Firemen and Enginemen's Magazine.*

Causes and Sources of Claims.

The stream of loss and damage claims may be likened to a great river. The sources of the stream, the little springs, are the General Managers, the Traffic Managers, the classifications, the rates, the Contracting Agents, the people who ship, who receive the goods, who handle cars, who unload freight, etc. . . The Transportation Department should see that cars are good before they are placed for loading; should see that as soon as loaded the handling is as prompt as it can be made, having all the time in mind the difference in classes and importance as to priority. Claims arise from rough handling, delays, divided into lack of billing, wrong car numbers or initials, failure to deliver billing with car, delivering wrong car to connecting line, even from the handling of cars in a spirit of bad feeling engendered by friction between employees of interchanging systems. Icing or not icing at the right time is the basis of hundreds of claims. This because modern demands have imposed added duties to that of mere transportation. One of them is the preservtion of perishables. Ordinarily a carrier is practically an insurer of the safe delivery at destination of all goods accepted for transportation. It can excuse itself only for well defined reasons, one of which is the character of the goods. But this has been greatly modified, and the carrier has to show that its acts in forwarding and caring for the goods have been "reasonable," to the satisfaction of a jury, or it may not be excused, even where the goods are of the most perishable character. If through failure to connect, a car of perishables has to be held, although it may have been already iced by the carrier delivering or holding, it may be necessary to re-ice, and a neglect in this regard may involve a claim. Hundreds of claims have had just this foundation. The claims which arise from loss or damage due to derailments, collisions, etc., look large because their items are large, but they are comparatively infrequent, and their aggregate, probably, is far below that of the steadily flowing volume of relatively small items.—*S. D. Webster, St. Louis.*

As Others See Us.

Two of our oldest contemporaries, and those that stand in the highest esteem among the railroad journals published in the English language, the *Railroad Gazette* of New York and the *Railway Age* of Chicago, have just been consolidated under the title of the *Railroad Age Gazette*, still maintaining their offices in New York and Chicago with correspondents established in Pittsburgh and London.

The *Railroad Age Gazette* is now the most complete and best informed special journal in the New World. Its technical and business staffs are of the first order and of a character that insures for the paper an overwhelming superiority and a great success.—*Journal des Transports.*

New Italian Railroads.

The law designed to provide for an increase in railroad mileage calls for the construction of 1,600 kilometers (992 miles) of new track, to cost $110,200,000, and divided into 16 divisions, starting in 1908-09 and running to 1923-1924. This appropriation is divided as follows: $800,000 for present service; $2,600,000 in 1908-09; $8,660,000 for 1909-1910; $14,040,000 for 1910-1911; $14,400,000 for 1911-1912, and the $72,400,000 remaining for other services.

The new roads to be built are as follows:

Three Calabrian lines for which, in addition to present appropriation, 7,000,000 lire have been devoted.

Line in Sicily at a cost of $6,000,000.

Line in San Arcangelo-Urbano at a cost of $5,400,000.

Lines in the Basilica to cost $18,000,000.

A direct line from Naples to Rome to cost $17,200,000.

A line from Genoa to Tortoni which will connect with the short line from Genoa to Milan; cost $30,000,000.

A direct line from Florence to Bologne to cost $30,000,000.

A line to connect the lines of Ponti-San Stefano Bello with those of Bra Nice and San Guiseppe-Acqui at a cost of $1,800,000.—*Journal des Transports.*

Traffic News.

At Wheeling, September 4, in the United States Circuit Court an injunction was asked for to restrain the Attorney-General of the state from prosecuting a suit to enforce the 2-cent passenger rate law of West Virginia.

Judge J. H. Coterall, of the federal court, rendered a decision at Enid, Okla., on September 7, holding that the law of Oklahoma, requiring railroads to separate negro from white passengers in their passenger coaches, is not in conflict with the constitution of the United States.

The Cleveland Freight Committee has revised switching rates at Cleveland. From one industry to another on the same railroad the rate will be 15 cents a ton. From one industry to another situated on different roads 25 cents a ton. No change is made in the rate of $2.50 per car where one road switches for another.

The Railroad Commission of Texas on September 1 issued an order restoring the cotton compress rules and regulations suspended by it on October 12, 1906. The order becomes effective on September 15. The rules which are now again put in effect require all railroads in transporting cotton to stop it at the first compress reached and have it there compressed. Small compress owners complained that while the rules were suspended they were discriminated against.

The traffic committee of the Illinois Manufacturers' Association has issued a circular letter to the traffic officers of the railroads, in which it complains regarding overcharges. Frequent exaction of more than the lawful rate is alleged, and it is attributed to the carelessness of rating clerks and to mistakes of shippers in giving descriptions of their shipments. The circular states that it has been found to be the practice of some roads to revise the waybilling and make prompt refund of overcharges without waiting for claims to be presented, while others carefully check the waybills for undercharges, but not for overcharges. They wait for claims to be presented, and in the event of no claim being made retain the money wrongfully collected.

American Association of Freight Traffic Officers.

The annual meeting of this association will be held at the Hotel Jefferson, St. Louis, Mo., on September 12. The morning session will begin at 10 o'clock and the principal business will be the election of officers. In the afternoon addresses will be delivered by Alexander P. Humphrey, General Counsel of the Southern Railway, and Hon. E. E. Clark, Interstate Commerce Commissioner. The annual banquet will be held at the Hotel Jefferson. A committee, of which W. B. Groseclose, General Freight Agent of the Missouri, Kansas & Texas, is chairman, has charge of the arrangements.

REPORT OF EARNINGS AND EXPENSES OF RAILROADS, MONTH OF JULY, 1908.

Name of road.	Mileage operated at end of month.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with July, '07.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$65,719	$40,964	$115,073	$22,066	$18,904	$2,788	$45,093	$4,891	$93,742	$21,331	$555†	$3,600	$17,176	‡$1,495
Ann Arbor	301	87,465	43,239	141,406	26,370	23,344	2,908	57,151	4,323	114,096	27,310	286	11,369	16,227	‡14,481
Atchison, Topeka & Santa Fe	7,470	3,744,520	1,539,889	5,761,474	727,631	1,003,100	110,304	1,539,993	114,696	3,495,724	2,265,750	.....	266,091	1,999,659	‡223,495
Atlantic Coast Line	4,407	1,170,020	441,370	1,742,338	286,825	283,078	31,627	666,723	62,794	1,331,047	411,291	3,871	90,000	325,162	33,849
Baltimore, Chesapeake & Atlantic	88	8,791	22,535	32,778	3,936	1,561	939	10,893	634	17,963	14,815	20,201	1,364	33,652	3,113
Bangor & Aroostook	515	114,911	51,602	181,334	35,199	21,387	2,987	61,751	9,715	131,040	50,294	11,189	1,500	59,983	‡10,001
Boston & Maine	2,242	1,701,091	1,311,931	3,275,122	406,750	371,649	43,115	1,393,097	70,521	2,285,132	989,990	9,267	137,136	862,121	‡174,181
Charleston & Western Carolina	341	68,967	25,255	101,778	20,075	11,521	2,187	35,767	4,144	73,694	28,084	241	4,100	24,225	40,747
Chesapeake & Ohio	1,842	1,595,228	409,837	2,095,132	262,003	369,518	37,683	553,985	41,491	1,264,680	830,452	940	65,900	765,492	‡24,857
Chicago & Alton	998	628,332	345,198	1,057,036	87,833	105,527	33,778	288,378	25,530	541,046	515,990	28,126†	30,000	457,864	167,320
Chicago & Northwestern	7,632	3,232,752	1,537,408	5,215,185	783,350	540,160	102,941	1,822,327	101,986	3,350,764	1,864,421	1,908†	230,000	1,632,513	‡169,990
Chicago, Lake Shore & Eastern	580	331,251	.....	358,500	35,550	74,990	1,049	104,519	5,320	221,428	137,072	.....	3,000	134,072	‡36,570
Chicago, Milwaukee & St. Paul	7,516	2,984,275	1,264,709	4,652,409	512,881	511,817	102,586	1,662,037	85,830	2,875,151	1,777,258	44,228	197,543	1,623,943	‡299,420
Chicago, Peoria & St. Louis	255	83,428	29,293	118,606	18,693	31,484	5,918	48,145	4,527	108,767	9,839	.....	4,600	5,239	9,070
Chicago, Rock Island & El Paso	111	40,045	20,152	65,817	6,046	11,207	755	21,987	1,904	41,899	23,918	.....	2,500	21,418	‡9,486
Chicago, Rock Island & Pacific	7,402	2,645,942	1,480,929	4,410,369	769,031	586,452	108,981	1,699,463	127,686	3,291,613	1,118,756	6,898†	146,769	965,089	‡64,514
Chicago, St. Paul, Minn. & Omaha	1,730	586,109	343,163	998,487	156,493	100,404	22,304	357,206	30,143	666,550	331,937	3,320	52,969	282,288	‡18,598
Cincinnati & Muskingum Valley	148	43,743	15,914	64,440	10,498	8,191	1,817	23,713	1,198	45,417	19,023	.....	3,900	15,123	‡2,479
Cleveland, Akron & Columbus	210	88,894	39,618	141,022	24,375	22,237	2,273	47,979	3,416	100,280	40,742	.....	6,000	34,742	‡20,447
Coal & Coke	191	37,387	14,676	53,965	10,079	12,680	625	14,808	2,174	40,366	13,599	4,437	3,500	14,536	7,269
Colorado & Southern	1,250	487,427	186,122	708,612	99,498	108,750	14,004	197,328	23,492	443,072	265,540	545	19,756	246,329	50,609
Colorado Midland	338	128,040	42,915	193,348	27,063	23,852	9,878	67,654	5,542	133,989	59,359	108	8,400	51,067	11,446
Cumberland Valley	162	141,393	50,009	200,433	24,416	15,000	4,164	59,583	5,026	108,189	92,244	690	3,713	89,221	‡18,261
Delaware & Hudson	845	1,125,149	306,148	1,476,488	146,103	169,789	31,354	519,206	31,292	897,744	578,744	386	35,000	544,130	‡136,249
Delaware Lackawanna & Western	893	2,042,846	637,555	2,859,239	384,011	367,155	54,550	760,956	50,033	1,616,705	1,242,534	1,270	112,800	1,131,004	‡148,002
Detroit & Mackinac	351	70,215	28,787	104,602	7,423	15,167	2,315	33,052	3,235	61,192	43,410	2,253†	6,843	34,314	14,747
Detroit, Toledo & Ironton	489	89,384	12,994	110,506	26,176	30,682	2,309	48,345	7,381	114,893	4,387*	56	6,979	11,310†	‡15,995
Duluth & Iron Range	168	952,823	19,205	981,989	70,997	56,667	202	129,911	7,437	265,214	716,775	9,992	39,776	686,991	199,784
Duluth, Missabe & Northern	273	1,444,201	28,933	1,478,668	73,394	92,551	758	152,848	13,841	333,392	1,145,276	10,323	60,256	1,095,343	530,778
Duluth, South Shore & Atlantic	595	120,513	91,852	226,114	43,805	22,623	9,437	76,750	11,748	164,363	61,751	2,923	15,000	49,674	‡44,338
Eastern Ry. of New Mexico	227	52,127	30,400	86,351	13,524	6,022	608	20,274	2,480	42,908	43,443	.....	3,308	40,136	‡9,139
Elgin, Joliet & Eastern	239	188,017	10	196,017	19,772	23,801	2,207	58,267	6,116	110,163	85,854	.....	9,500	76,354	‡41,207
El Paso & Southwestern	867	437,689	87,387	550,276	73,211	83,989	9,329	150,786	21,967	339,282	210,994	.....	11,186	199,808	.....
Grand Rapids & Indiana	582	181,853	157,299	367,697	45,930	51,680	10,324	140,238	13,646	261,818	105,879	376†	20,761	84,742	‡25,305
Great Northern	6,672	3,127,779	1,060,795	4,450,493	1,278,584	526,570	52,770	1,088,927	93,202	3,040,053	1,410,440	34,095	157,293	1,287,242	‡835,236
Gulf & Ship Island	307	92,337	30,638	131,113	32,269	25,461	1,455	50,091	7,267	116,543	14,570	.....	3,685	10,885	‡52,415
Gulf, Colorado & Santa Fe	1,518	601,650	235,983	888,312	158,139	142,459	18,252	318,498	31,841	669,189	219,123	.....	32,429	186,694	163,662
Lehigh & New England	167	61,652	1,651	64,942	12,197	6,679	814	17,089	2,431	39,210	25,732	.....	850	24,882	‡6,283
Louisville & Nashville	4,365	2,574,377	891,037	3,680,352	428,900	593,769	85,041	1,183,621	79,619	2,370,950	1,309,402	8,956†	112,337	1,188,109	152,769
Louisville, Henderson & St. Louis	200	38,568	34,519	77,448	19,301	6,979	3,187	26,389	2,746	58,602	18,846	578	2,500	16,924	‡5,713
Mineral Range	129	67,085	4,927	73,826	15,211	9,863	1,005	31,484	3,335	60,898	12,928	.....	3,000	9,928	‡2,153
Missouri, Kansas & Texas	3,072	1,195,435	549,984	1,868,266	263,701	321,253	45,899	756,567	64,454	1,451,874	416,392	33	64,652	351,773	‡521,290
Mobile & Ohio	926	517,742	106,256	727,166	87,255	107,357	26,651	270,528	28,790	520,581	206,585	7,728†	16,100	182,757	‡43,351
New Orleans & North-Eastern	196	151,923	43,258	207,640	18,238	36,022	6,982	76,618	9,230	147,090	60,550	306†	6,500	53,744	‡16,891
New York, Chicago & St. Louis	553	544,381	125,521	692,740	71,753	84,304	45,284	271,723	14,151	487,215	205,525	608†	28,000	176,917	7,681
New York, Ontario & Western	546	541,516	243,046	816,912	87,481	121,492	10,349	253,148	13,581	486,051	330,861	3,741	15,417	319,185	‡8,554
New York, Philadelphia & Norfolk	112	200,397	35,143	255,283	18,236	42,274	2,633	89,006	7,751	159,900	95,383	.....	6,215	89,168	‡31,145
Norfolk & Western	1,920	1,979,638	310,071	2,369,825	285,633	368,556	37,052	667,274	52,456	1,410,971	958,854	326	87,600	871,580	‡153,259
Northern Central	473	627,902	176,044	862,010	13,922	160,180	13,718	394,397	18,168	600,385	261,625	1,227	19,514	243,338	4,536
Northern Pacific	5,649	3,653,413	1,693,452	5,679,525	747,209	661,727	84,669	1,524,195	85,288	3,103,088	2,576,437	31,669	227,181	2,380,925	‡605,363
Pecos & Northern Texas	153	56,823	19,424	79,998	5,308	6,005	673	20,449	2,724	35,159	44,839	.....	2,011	42,828	37,112
Pennsylvania Co.	1,414	2,686,580	612,394	3,590,020	299,044	519,934	64,800	1,145,238	71,654	2,100,670	1,489,350	825†	122,060	1,366,465	‡175,628
Pennsylvania R.R. Co.	4,163	7,644,159	2,537,413	10,932,967	1,286,946	1,770,227	162,947	3,971,441	257,948	7,449,509	3,483,458	117,360	174,339	3,426,479	‡816,214
Philadelphia, Balt. & Wilmington	714	740,924	540,450	1,425,724	188,582	220,747	21,080	575,349	25,295	1,031,053	394,671	328†	31,142	363,201	27,044
Pitts., Cin., Chic. & St. Louis	1,472	1,721,934	620,698	2,655,202	252,453	449,742	63,155	917,796	54,878	1,738,024	917,178	422†	103,335	813,421	10,965
St. Louis & San Francisco	4,727	1,729,466	750,683	2,694,560	431,295	355,297	55,183	959,767	95,424	1,896,966	797,594	4,564†	91,547	701,483	‡151,019
St. Louis Southwestern of Texas	697	185,464	75,187	281,291	82,361	63,610	8,907	130,664	14,303	299,845	18,554*	238†	9,167	27,959†	‡72,534
Southern Kansas of Texas	125	42,264	16,649	61,973	14,567	9,326	631	21,159	2,602	48,285	13,688	.....	2,236	11,452	‡40,332
Southern	7,294	2,594,776	1,211,166	4,147,236	492,810	584,356	95,159	1,481,804	141,274	2,795,403	1,351,833	6,501	161,559	1,196,775	405,577
Texas & Pacific	1,885	604,439	298,114	966,025	151,168	158,778	13,781	418,440	33,486	775,653	190,372	1,492†	82,903	105,977	‡159,021
Toledo, Peoria & Western	248	52,265	34,377	91,364	16,629	16,286	2,089	31,816	3,441	70,261	21,103	.....	4,000	17,103	8,382
Toledo, St. Louis & Western	451	231,846	42,106	293,814	30,029	47,700	9,585	92,947	8,550	188,811	105,003	16,255†	11,500	77,248	‡1,514
Union R.R. of Baltimore	10	76,533	16,188	94,323	5,214	.....	199	4,576	1,370	11,359	82,964	.....	2,881	80,083	‡27,625
Vandalia	829	436,183	191,622	704,925	116,236	112,681	19,420	262,254	16,219	526,810	178,115	.....	25,283	152,832	‡2,822
Vicksburg, Shreveport & Pacific	171	56,597	40,143	106,094	16,724	18,317	3,569	33,848	4,003	76,461	29,633	412†	5,800	23,421	8,068
Wabash	2,515	1,332,133	578,800	2,077,977	231,659	319,481	69,631	770,749	58,965	1,450,485	627,492	722	63,255	564,959	‡113,458
West Jersey & Seashore	371	140,996	469,852	666,713	78,878	54,517	16,511	222,195	7,241	379,342	287,371	2,076	17,112	272,335	‡32,839
Wisconsin Central	1,023	446,554	166,648	651,649	80,803	72,939	24,289	208,848	18,554	405,433	246,216	935	29,090	218,061	‡68,208

*Deficit. † Loss. ‡ Decrease.

Reduced Rates in Arkansas Enjoined.

Judge Van Deventer, of the United States Circuit Court, issued a temporary injunction at St. Paul, Minn., on September 3, restraining the Railroad Commission of Arkansas from enforcing the state 2-cent fare law or from interfering with attempts of the railroads to raise freight rates. Judge Van Deventer held that the 2-cent passenger fares and the freight rates fixed by the Commission were not compensatory and were therefore unconstitutional. He directed that each of the four roads that were parties to the suit should give a bond of $200,000 that it would keep an accurate account of the difference between its tariff charges and what it would have charged if the rates fixed by state authorities had not been suspended, and that in case the suit should finally go against the roads they should return to passengers and shippers or consignees of freight all the excess charges collected. In the course of his opinion Judge Van Deventer said:

"The proofs make it quite plain that the production of a given amount of revenue is attended with greater cost in intrastate business than in interstate business. Here the additional cost is shown to be at least 100 per cent. in freight traffic, and 15 per cent. in the passenger traffic and this is practically what has been shown in other cases. Undoubtedly these differences furnish a standard by which to apportion the total cost between the traffic which is intrastate and that which is interstate, and, while other standards are suggested, the proofs indicate that none of them is as satisfactory or accurate as is the difference in cost. It must therefore be applied.

"When this is done the result shows that the earnings of each road from its intrastate freight traffic are much less than the proportion of the operating expenses and taxes properly attributable to them, and the earnings of two of them from intrastate passenger traffic are a little less than the proportion of the operating expenses and taxes properly attributable to them. As to two of the roads the earnings from the traffic last named are somewhat in excess of the proper proportion of the operating expenses and taxes, but none enough so to yield a return of 1 per centum per annum upon that proportion of the value of the property rightly attributable to such traffic. The conclusion necessarily follows that these rates, both freight and passenger, are non-compensatory and unreasonable, and that their enforcement, although not so intended, is nothing other than using or taking of the property of these railroad companies without due compensation, which is confiscation. This the Constitution of the United States does not permit.

"But it is urged that a temporary injunction ought not to be granted because these railroads have heretofore applied and given effect to the rates in question, the contention being that a temporary injunction may be employed to preserve the *status quo* pending the suit, but not to change it. It may be conceded that such an injunction is generally employed as stated, and that the courts are generally reluctant to employ it otherwise, but this does not mean that they may not or ought not to do so if the exigencies of the case require it, for, as has been often held, courts of equity are not thus limited in their powers, but may by a temporary injunction effect a change in the *status quo* if it be necessary to do so, as here, to avoid irreparable injury from what is plainly a continuing wrong."

Traffic Club of St. Louis.

The fourth meeting of the Traffic Club of St. Louis will be held at the Glen Echo Country Club on Tuesday evening, September 15, at 6:30 o'clock, when an informal dinner will be given. It is expected that the dinner will be attended by a number of prominent railroad men and shippers from other cities.

Crop Report.

The Department of Agriculture reports the condition of corn on September 1 was 79.4 per cent. of a normal, as compared with 82.5 last month, 80.2 on September 1, 1907, 90.2 on September 1, 1906, and a ten-year average on September 1 of 81.0 per cent. The average condition of spring wheat when harvested was 77.6 per cent. of a normal, as compared with 80.7 last month, 77.1 when harvested in 1907, 83.4 in 1906, and a ten-year average when harvested of 77.9. The average condition of barley when harvested was 81.2, against 83.1 last month. The average condition of the oat crop when harvested was 69.7 per cent., against 76.8 last month.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Carolina, Clinchfield & Ohio is in the market for 25 consolidation (2-8-0) locomotives.

The Virginian Railway expects to be in the market soon for 30 Mallet (0-8-8-0) locomotives.

The Kansas City, Ozarks & Southern is in the market for one electric locomotive to weigh about 40 tons.

The Prarie Pebble Phosphate Co., Mulberry, Fla., has ordered two electric locomotives from the Baldwin Locomotive Works.

The Ohio & Michigan Sand & Gravel Co., 1019 Nicholas building, Toledo, Ohio, is in the market for a light standard gage mogul or 10-wheel second-hand switching locomotive.

The Isthmian Canal Commission has awarded the contract for 10 switching (0-6-0) locomotives to the H. K. Porter Co., Pittsburgh, Pa. Specifications for this equipment was published in the *Railroad Age Gazette*, August 14.

The Isthmian Canal Commission will receive bids until Sept. 28 for 12 single-truck, four-wheel, 36-in. gage electric mine locomotives. These locomotives are not to exceed 6 ft. 6 in. in width and are to be approximately 12 ft. long. Rigid wheel base is not to exceed 5 ft. 3 in. and the wheels are to be 22 in. in diameter. They are to be used in building the Gatun locks.

CAR BUILDING.

The Chicago, Cincinnati & Louisville has ordered 460 box cars from Haskell & Barker.

The Kansas City Railway & Light Co., Kansas City, Mo., has ordered six cars from the St. Louis Car Co.

The Oregon Electric Railway Co., Portland, Ore., has ordered eight cars from the Niles Car & Manufacturing Co.

The Dairy Shippers Despatch has ordered 100 thirty-ton refrigerator cars from the Ryan Car Co. for November delivery.

The Nashville Interurban, Nashville, Tenn., is reported to have placed an order for three electric cars. This item is not yet confirmed.

The Central of Georgia is in the market for 16 passenger cars. Reference to these cars was made in the *Railroad Age Gazette* of July 31.

The Atchison, Topeka & Santa Fe has ordered 500 refrigerator cars from the American Car & Foundry Co. and three smoking and passenger cars from the Pullman Co.

The Chicago, Cincinnati & Louisville is in the market for two café parlor cars, in addition to the four passenger cars reported in the *Railroad Age Gazette* of September 4.

The Kansas City, Ozarks & Southern is in the market for two combination passenger baggage and express cars to be about 40 ft. long and equipped with four 50 h.p. motors each.

The Isthmian Canal Commission will receive bids until Sept. 28 for 24 ten-ton, 36-in. gage flat cars. These cars are to be 7 ft. wide over all, with a height of platform above track not to exceed 2 ft. 8 in. The wheel base is not to exceed 4 ft., the wheels to be 21 in. in diameter.

The Harriman Lines have ordered 2,450 fifty-ton box cars, 1,000 fifty-ton flat cars and 450 ballast cars from the American Car & Foundry Co.; 170 fifty-ton hopper cars and 490 fifty-ton gondola cars from the Cambria Steel Co.; 450 forty-ton stock

cars, 50 thirty-ton furniture cars and 70 cabooses from the Standard Steel Car Co.

The Metropolitan Street Railway, New York, has ordered 125 pay-as-you-enter cars, 75 bodies for which will be built by the J. G. Brill Co., and 50 by the Jewett Car Co. The J. G. Brill Co. will build 75 trucks for these cars and the Standard Motor Truck Co. will build 50.

IRON AND STEEL.

The Peruvian Railways, Peru, South America, have ordered 1,000 tons of 70-lb. rails from the Carnegie Steel Co.

The Chicago & North-Western is asking prices on 12,000 tons of structural steel for its main terminal building in Chicago and will later ask for bids on other buildings involving 30,000 tons.

RAILROAD STRUCTURES.

CHICAGO, ILL.—The Sanitary District of Chicago will ask bids in about two weeks for constructing the foundations of the Chicago & North-Western bridge at Mayfair crossing on Shore Channel. The work will cost about $40,000. George M. Wisner, Chief Engineer, American Trust building.

Bids are asked by the Bureau of Navigation, Navy Department, Washington, D. C., until September 17, for building a railroad trestle to the power house at the naval training station, Great Lakes, North Chicago, Ill.

CLOVIS, N. MEX.—The Atchison, Topeka & Santa Fe has awarded to Charles Fellows, Los Angeles, Cal., the contract for building a machine shop, storehouse and blacksmith shop. Contract price, $35,000.

HAMMOND, IND.—The Chicago, Cincinnati & Louisville has purchased ten acres of land on which it is to build a division machine shop and roundhouse.

HOUSTON, TEX.—The Missouri, Kansas & Texas expects to begin the erection of new coal chutes, to replace those burned last winter, as soon as the track for the main line is built to the new passenger station. The new chutes will be equipped with automatic machinery.

JACKSONVILLE, FLA.—Plans have been completed and approved for a new storage warehouse to be built by the Seaboard Air Line in the Hogan street yards. Work is to be commenced by Jan. 1. The new warehouse will be built of corrugated iron, 100 ft. x 300 ft., and will cost about $40,000. In addition to the above work this road, it is said, will expend $25,000 in rebuilding the Morgan street yards. The new $1,000,000 shops in the western section of the city are practically completed, and the new $35,000 lumber docks were completed some time ago (R. R. G., April 12, p. 530) at Columbus, Ga.

The Central Railroad of Georgia will, it is said, build a new passenger station at Jacksonville.

LEXINGTON, KY.—The Lexington & Interurban has given the contract to the Combs Lumber Co. for erecting a new car barn and repair shop, 100 ft. x 200 ft. (July 31, p. 641.)

L'ORIGINAL, ONT.—Sealed tenders will be received by O. Duford until noon Oct. 6, for building a steel bridge, on concrete abutments, across Castor river.

PORT HURON, MICH.—The Grand Trunk has plans prepared for a wood machine shop having 10,000 sq. ft. of floor space, in connection with its new shops.

RUSTON, LA.—Local reports say that the Vicksburg, Shreveport & Pacific and the Chicago, Rock Island & Pacific will jointly build a union passenger station in the near future.

ST. LOUIS, MO.—The Municipal Bridge and Terminals Commission introduced a bill in the city council on September 1, to abolish the Compton avenue grade crossing over Mill Creek Valley. The bill also authorizes the Terminal Railroad Association to do about $2,500,000 worth of work in the way of track extensions and other improvements in Mill Creek Valley. The proposed changes include also new Pullman yards and team tracks.

The Board of Public Improvements has made recommendations and prepared plans for the proposed free bridge across the Mississippi river. A feature of the plans is the recommendation that no provision be made for connections with the railroads composing the Terminal Railroad Association, because these are bound by contract to patronize only the bridges and ferries controlled by that corporation.

SIOUX CITY, IOWA.—Plans have been made by the City Engineer for a reinforced concrete viaduct to be built over the railroad track at Wall street, at a cost of about $180,000.

WAGONER, OKLA.—The Missouri, Kansas & Texas is reported to have prepared plans for erecting a new 24-stall roundhouse, also machine shops, 300 ft. x 420 ft.

SIGNALING.

Orders for Interlocking Signals.

The General Railway Signal Co. has received orders to install interlocking signals for the Erie Railroad at Columbus, Pa. (36 levers); at Lakewood, N. Y. (24 levers), and at Niobe, N. Y. (36 levers). The company will also install electric interlocking for the Chicago & North-Western at East Clinton, Ill. (a 28-lever machine), and is furnishing the material for an 80-lever electric interlocking plant on the Chicago, Burlington & Quincy at Ashland avenue, Chicago.

Three-Position Automatic Block Signals on the Rock Island.

The Chicago, Rock Island & Pacific on Tuesday last put in service automatic block signals on the Missouri division (double track) between Davenport and Muscatine, Iowa, 25.35 miles. There are 37 automatic signals, three semi-automatic power-operated signals and two semi-automatic slotted signals. The automatic signals are three-position, style B, made by the Union Switch & Signal Co., Swissvale, Pa. Line circuits are used throughout, the 90 deg. (caution) indication being controlled by a pole ranger on the signal in advance, acting on a 500-ohm polarized relay. There are no relayed track sections, but where cuts are necessary the line circuit is broken. The line circuit is also broken through switch boxes on all facing points. All switches are provided with indicators, there being 60 in all. Track relays are 4 ohms resistance. All relays are the Union Switch & Signal Co. Universal type. All the apparatus was installed by the railroad company's forces.

SUPPLY TRADE NOTES.

B. B. Lacy, inventor of the Anderson-Lacy electric headlight, is now in Mexico City putting lights on some of the engines of the Mexican Central.

The receivership for Milliken Brothers, structural iron and steel contractors, expired September 1, but the receivers are to continue to operate the plant until October 1.

The address of the Southern Representative of the Buckeye Steel Castings Co., Columbus, Ohio, has been changed from 305 Peters building to 835 Equitable building, Atlanta, Ga.

The seats to be used in the 650 cars for the Chicago Railways Company, the specifications for which were printed in our issue of August 14, will be made by the Hale & Kilburn Manufacturing Co., Philadelphia, Pa.

John C. Sesser, formerly Engineer of Maintenance of Way of the Missouri District of the Chicago, Burlington & Quincy, has been appointed Contracting Engineer for the Walsh Construction Co., Davenport, Iowa, with headquarters at Chicago.

The Clark Cast Steel Cement Co., Shelton, Conn., announce that its Chicago interests have been placed in the hands of R. T. Oglesby, 34 South Clark street, Chicago. The Clark company was formerly represented by Francke L. Jones, who on account of change of residence was forced to cancel his representation in Chicago.

The L. M. Booth Co., 136 Liberty street, New York, maker

of water softening apparatus, has engaged the services of W. R. Toppan and W. H. Green, formerly with the Kennicott Water Softener Co., Chicago Heights, Ill. Mr. Toppan becomes Vice-President and General Manager with office in Chicago and will have charge of the steam railroad department. Mr. Green will cover the Middle West, with headquarters in Chicago.

Dixon Boardman, formerly Special Agent of the Hall Signal Co., New York, has returned to that company, and is now in England as Manager for Great Britain, with office at Queen Anne's Chambers, Westminster, London, S. W. His work is particularly in connection with the manufacture of Hall signals in Great Britain, as required by the British patent law which recently went into effect. Mr. Boardman represented the company in England two years ago.

The Alliance Machine Co., Alliance, Ohio, has a large order for electric traveling cranes for the Gary, Ind., plant of the United States Steel Corporation. There will be 17 cranes, as follows: Two 75-ton patented ladle cranes of 75 tons capacity each; three 50-ton cranes; one 40-ton crane; three 20-ton cranes; three 15-ton cranes; three 10-ton cranes, and two 5-ton cranes. The company has also received orders recently for about 25 cranes for miscellaneous uses.

The Carter Lumber Co., Houston, Tex., recently sent a ship load of ties to Tampico, Mexico, for the National Lines of Mexico, to be used on new construction between Tampico and the City of Mexico. This company, which was organized about three years ago, makes a specialty of railroad materials, such as ties, bridge timbers and car materials, the last-named including linings, roofings, sidings, etc. It is a large manufacturer of long-leaf yellow pine lumber, owns large forests and operates four complete sawmills. Its operations extend throughout the yellow pine consuming territory of the United States, and into Mexico, Cuba, Yucatan and Central America, the trade in these foreign countries being large. It is also a large shipper of mining timbers, props, etc. J. P. Carter is President; J. S. Rice, Vice-President, and G. M. Duncan, Secretary. The general offices are at Houston, near the timber holdings and mills.

The business of the Battery Supplies Co., Newark, N. J., manufacturer of the Gladstone Lalande battery and the newer type known as the BSCO battery, has been acquired by the Edison Manufacturing Co., Orange, N. J., together with all patents, rights, etc., appertaining to the manufacture of those batteries. The name of the Battery Supplies Co. has been discontinued, and the company has been merged with the Edison company. The essential features of the Gladstone Lalande battery being similar to those of the Edison primary battery, and as the Gladstone battery elements were designed to be interchangeable with the Edison types, the manufacture of the Gladstone battery will be discontinued and cells or renewals for it should be ordered by their corresponding Edison types. The Gladstone type G-60 is similar to Edison type "SS," and type G-50 is similar to Edison type "RR." The railroad companies that have ordered Gladstone renewals with the oxide plates assembled in frames may return the exhausted renewals to the Edison company; that is, the oxide plates with frames and zincs with hangers, and the usual credit will be allowed to apply on orders for new material. Assembled renewals furnished on all future orders will be equipped with the Edison channel frames. The BSCO battery is a 350-ampere hour cell, which has a longer life, and will give as efficient service as the type "SS" cell. In addition, the oxide plate and zinc are permanently secured to the holder, which, in turn, is fastened to the cover by simply screwing up one nut, which simplifies the maintenance. It is made in two styles, one with the ordinary sodium solution, the other of the same size and having the same ampere hour capacity, but with a special low temperature solution, which is designed for use at points where the batteries are not placed in wells, and where there is great variation in temperature which affects the ordinary form of battery. For railroad work the Edison company has added a new cell known as type "M," the elements of which are contained in the regular "SS" jar, using the Edison channel frame, which has a capacity of 400 ampere hours. This type is also supplied with the special low temperature solution for use at points where the demand upon a battery is severe, and where long life and the ability to withstand low temperatures are factors.

TRADE PUBLICATIONS.

Cast Steel Cement.—The Cast Steel Cement Co., Shelton, Conn., is distributing a small folder describing and giving directions for using its metallic cement.

Steam Shovels.—Bulletin No. 33 of the Browning Manufacturing Co., Mansfield, Ohio, contains a general description of the Browning revolving steam shovels and also a number of half-tone illustrations of construction work in which these shovels are being used.

Rock and Ore Breaker.—Gates rock and ore breaker, style K, manufactured by the Allis-Chalmers Co., Milwaukee, Wis., is described in Bulletin No. 1416. The style K machine is new from the spider to the base, although the fundamental principle of gyratory breaking remains.

Valves.—Catalogue No. 11 for August, 1908, of the Golden-Anderson Valve Specialty Co., Pittsburgh, Pa., illustrates and describes a large number of valves, including the Anderson cushioned non-return valves, emergency stop valves, heavy globe valves, high and low-pressure tilting steam traps, etc.

Ore and Coal Handling Plants; Grab Buckets.—The Andresen-Evans Co., Chicago, in Bulletin No. 1, just issued, describes its clam shell and grab buckets, conveying bridge and unloading and storage plant. The catalogue is well illustrated with detail drawings showing the mechanism of the grab buckets in different stages of operation as well as the principle of the conveying bridge and unloading and storage plant.

Portland Cement.—The September bulletin of the Universal Portland Cement Co., Chicago and Pittsburgh, contains an article describing a new system of reinforced concrete construction. The plan is that of building concrete walls in nearly a horizontal position and raising them to an upright position after the concrete has hardened. Several views are shown of various structures that have been made from Universal Portland cement.

Water Purification.—The Automatic Water Purifier was designed with the view of getting a treated water of uniform and proper composition, which necessitates both the chemical and the mechanical treatments. The catalogue of the Purification & Engineering Co., New York, contains a quantity of valuable and instructive information on this subject and also a number of illustrations of installations of the various types of this Automatic Water Purifier. The catalogue is intended for the manufacturer who realizes the advantages and necessity of using in his boiler or industrial processes properly purified water.

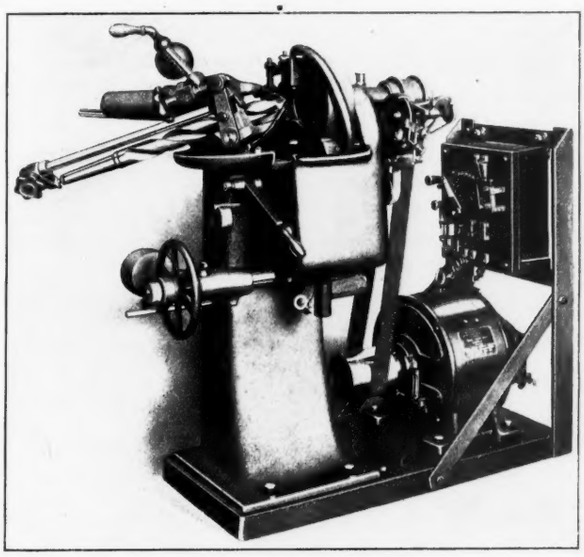
Power-Driven Pumping Machinery.—Catalogue No. 71, issued by Dean Brothers, Indianapolis, Ind., illustrates and describes the power-driven pumping machinery which the firm makes. The types of the pumps listed may be driven by belt, electric motor or other power. Special attention is called to the fact that its duplex power pumps are driven by gears at each end of the crank shaft. No power is transmitted from one crank to the other and tortion strains between the cranks are eliminated. The publication is well illustrated, two pages being devoted to a list of the parts of duplex geared power pumps with accompanying detailed drawing.

Concrete Piles.—The Raymond Concrete Piling Co., New York and Chicago, has issued a catalogue describing the Raymond system of concrete piling. The advantages of Raymond concrete piles are gone into in several chapters in which are discussed the method of making, the influence of the shell upon the permanence of the piles, the advantages of the tapering shape, the economies, placement, reinforcement, carrying capacity, cost, standard sizes and specifications. These chapters are illustrated with drawings showing the relative economy of Raymond piles as compared with wooden piles and a reproduction from a photograph showing a pile core. The last two pages are devoted to a list of some of the users of these piles, including architects, engineers, railroad and industrial companies.

Drill Grinding Machine.

The correct shape for a drill, either of the flat or twist type, should be maintained in order to obtain the maximum amount of work from it. Hand grinding does not give this correct shape and more power is required for the hand-ground drill than for a machine-ground one. A drill incorrectly ground will not bore a uniform hole to size, while drills correctly ground and pointed will not only drill to size with minimum power, but, when straight, will wear the drill press less. The force required to hold an incorrectly ground drill steady brings a strain on the drill press which causes spindle bearings to wear.

The drill grinding machine illustrated herewith was manufactured by William Sellers & Co., Philadelphia, Pa., and is equipped with a standard Westinghouse 2 h.p. motor. The



Sellers Drill Grinding Machine.

entire outfit is self contained with starting switch and motor complete. The grinder is suitable for any type of double-tip drills, varying from $\frac{5}{16}$ in. to 3 in. in diameter.

The grinding of the tips is done on the face of the grinding wheel and the drill is moved over the entire face of the wheel. By a special device the correct pointing of the drill is secured. An interesting feature is the method adopted for providing an ample supply of water at the grinding surface. The wheel proper is protected by a cover except where the drill comes in contact with it. On the cover there is an adjustable nozzle through which water is delivered in an abundant flow to both drill and wheel without waste. The water is moved by a small centrifugal pump driven from the main motor. The entire equipment is simple and a skilled workman is not required.

The application of the motor to this grinder permits the machine to be located in the shop at any point desired, without reference to shafting or belts. It secures the maximum economy of driving power, inasmuch as the entire outfit may be stopped when not in use.

Speed Counter.

The accompanying illustration shows a new speed counter made by the Veeder Manufacturing Co., Hartford, Conn. This instrument is unique in design and is said to be entirely different from any other counter now on the market. The registering apparatus is an ordinary revolution counter. The instrument works equally well at high or low speeds, the maximum speed for which it is recommended being about 5,000 r.p.m. It may, however, be run up to 10,000 r.p.m. This range gives it sufficient capacity for all ordinary purposes.

Veeder Speed Counter.

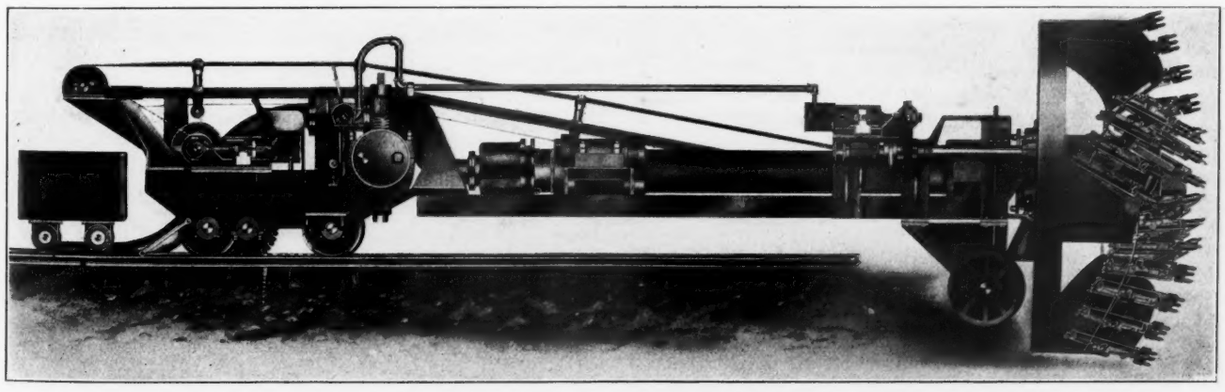
In using the counter, its point is placed against the center in the revolving shaft. The mechanism within the counter consists of a clutch, the two parts of which are held apart by a spring. It is necessary to record the reading of the counter before exerting the pressure necessary to overcome the spring and engage the two parts of the clutch, which engagement causes the counter to register. No set-back arrangement is provided. It is said that resetting renders instruments of this kind inaccurate. This counter may be used for shafts revolving in either direction.

Due to the fact that the point of the counter may be placed against the revolving shaft without disturbing the register before it is desired to record the revolution, the count is accurate, as it is only necessary to exert and release a slight pressure at the beginning and end of the readings. Another advantage is that an accurate count can be obtained without the aid of a stop-watch. The instrument is very compact and weighs but a few ounces. A rubber tip is provided which effectually insulates the counter so that it is not rendered inaccurate by a strong magnetic field in connection with electrical machinery.

New Tunneling Machine.

The accompanying illustration, made from a wash drawing, shows the general appearance of a new tunneling machine which is being built at the Harlem River yards of Terry & Tench, contractors, New York. It was designed by O. S. Proctor, working in conjunction with Terry & Tench.

The head carrying the drills is to be 8 ft. in diameter. This



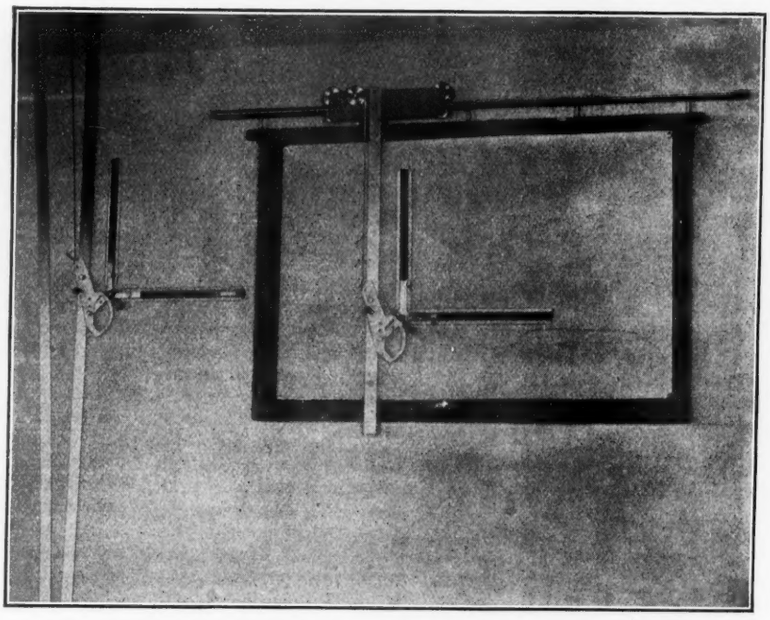
Machine for Driving Eight-Foot Tunnel.

head is attached to the main horizontal shaft, which revolves at the rate of about one revolution a minute, being driven through worm gears by a 10 h.p. compressed air engine carried on the front truck. There will be about 25 drills of the piston type, each cutting a 4-in. path as the head revolves. They are so arranged that the same amount of rock will be cut away at the outer part of the head as at the inner part, there being four drills cutting in the same path at the periphery and correspondingly fewer toward the center. The drills are surrounded by a shield with wings so arranged as to catch the muck from the face of the rock, carry it up to the top as the head revolves and there drop it into a belt conveyor which carries it to the rear of the machine. The main shaft is hollow and through it the compressed air is fed to the drills. On the rear truck is a system of vertical and horizontal screws, by which the rear end of the main shaft may be swung in any direction and the cutting head thus aimed properly. The machine is driven forward and held against the rock by a rack and pinion, the pinion being driven by another 10 h.p. compressed air engine geared down about 1,000 to 1.

It is expected that the present machine will be finished in about two months. For use in tunnels with a diameter of more than 8 ft., it is planned to use two machines, the smaller one first boring a small tunnel and the second machine following it up with drills set in an annular ring of the required diameter.

New Drafting Instrument.

The Emmert Manufacturing Co., Waynesboro, Pa., is making and selling the Noyes vertical T-square, a drafting instrument of considerable novelty. This instrument comprises a vertically arranged T-square guided at the top of the drawing board, and having a protractor with scales sliding vertically on it. The head of the T-square is provided with a set of four rollers guided upon a straight steel track which is fastened to the top of the drawing board. One pair of these rollers is beveled, and runs on ball bearings so arranged that the weight of the head holds it upon the track with no lost motion, making possible a very free and sensitive movement. The head also carries a spring-balanced drum to which is attached a cord which connects with the vertically sliding protractor and acts to hold the latter to the blade. The protractor is also guided upon the blade by rollers, giving it a very sensitive vertical movement. It is thus evident that the instrument always moves in true horizontal and vertical lines. Pivoted to the sliding protractor is a forked arm to which interchangeable scales are attached. This arm is provided with a worm which engages notches cut in the rim of the protractor and which can be quickly pressed out of engagement. These notches are spaced 3 deg. apart, making it possible to quickly set the instrument to any multiple of 3 deg., which includes all the most commonly used angles, 0, 15, 30, 45, 60, 75 and 90. The 3-deg. angle is exceedingly handy as it is the usual draft given to patterns, is suitable for the conventional angle used for showing screw threads and various other cases. To obtain fine adjustment, the neck of the worm is graduated with 12 divisions, each of which represents ¼ deg. One-half of this can be easily read, which is as fine as is ever necessary for drawing. Interchangeable scales are provided, furnished with any desired graduations.



Noyes T Square and Drafting Instrument.

In addition to these advantages of the instrument for the horizontal board, it is particularly adapted to the vertical. It combines T-square, protractor, scales and triangle, depending from the top of the board, while with the old arrangement one of these articles is usually on the floor, and the rest scattered along the parallel rule. It eliminates the use of the parallel rule with its possible inaccuracies and troubles. A further extension of the use of this T-square is in making large drawings, as it may be applied to a board for 10-ft. x 6-ft. drawings. In this way it is possible to make a full sized drawing of a large machine with the same ease, accuracy and speed as small drawings.

Creosoting Plant.

Consul-General Benjamin H. Ridgely, of Mexico City, reports that the Mexican Central Railway has decided to creosote all its ties in the future, and has asked for bids on a creosoting plant, with a capacity for treating 100,000 ties monthly.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

G. B. Jenkins, Cashier of the Norfolk & Southern, has resigned.

K. D. Dunlop has been elected a Director of the Chicago Great Western, succeeding H. E. Fletcher.

W. E. Green, Vice-President and General Manager of the Trinity & Brazos Valley, has resigned. R. H. Baker, President, will assume the duties of General Manager.

M. J. Gordon, Division Counsel of the Great Northern at Spokane, Wash., has resigned to engage in other business. Albert J. Laughon, first assistant to the Division Counsel succeeds Mr. Gordon.

F. P. Best, whose resignation as Traveling Freight Agent of the Southern Pacific at Mexico City has been announced in these columns, has been appointed Cashier and Chief Clerk of the Havana-New Orleans steamship line of the Southern Pacific, with office at Havana, Cuba.

Operating Officers.

G. S. Flourney has been appointed Assistant General Manager of the Fitzgerald, Ocilla & Broxton, with headquarters at Fitzgerald, Ga.

D. W. Steefer has been appointed Acting Trainmaster of the Grand Trunk Pacific at Westford, Ont. W. C. Caruthers has been appointed Chief Despatcher at Melville, Sask.

L. E. Weidner has been appointed Inspector of Stations of

the Philadelphia & Reading, the Atlantic City Railroad and the Gettysburg & Harrisburg, with office at Reading, Pa.

J. N. Pemberton has been appointed Acting Trainmaster of the Missouri Pacific, Council Grove district, with headquarters at Hoisington, Kans., in place of F. J. Avery, granted leave of absence.

G. W. Taylor, Superintendent of Transportation of the Southern Railway, has been appointed General Superintendent of Transportation, with office at Washington, D. C. His former office has been abolished.

Silas W. De Wolf has been appointed General Superintendent of the Texas-Mexican, with headquarters at Laredo, Tex., succeeding Font Rice, Jr. The appointment of H. A. Vaughan to this position, which was announced in these columns September 4, was recalled by President E. N. Brown.

Traffic Officers.

R. E. L. Bunch, Traffic Manager of the Norfolk & Southern, has resigned.

E. R. Lauer has been appointed Agent of the Erie Despatch at St. Joseph, Mo., succeeding P. W. Peterson.

J. S. Kimmerly has been appointed Traveling Agent of the Chicago, Rock Island & Pacific at Fort Worth, Tex.

J. S. Brown has been appointed Assistant General Freight Agent of the Illinois Central, with headquarters at Chicago.

S. A. Kendig, Traveling Passenger Agent of the Atchison, Topeka & Santa Fe at Temple, Tex., has been transferred to Houston.

C. C. Taylor, Freight Agent of the Mobile & Ohio at Jackson, Tenn., has been appointed Traveling Freight Agent at that place.

M. J. Tarpy has been appointed Passenger Agent of the Canadian Pacific at Niagara Falls, N. Y., succeeding R. F. Schornstein.

C. H. Gulick has been appointed Soliciting Freight Agent of the Lehigh Valley at Auburn, N. Y., succeeding W. L. Donaldson, resigned.

A. F. Dion, Freight Agent of the Quebec & Lake St. John at Quebec, Que., has been appointed Freight Agent of the Canadian Northern Quebec, succeeding S. F. Beamish.

F. W. Milling has been appointed Traveling Freight Agent of the Baltimore & Ohio at Huntington, W. Va., succeeding G. M. Freer, whose title was Commercial Freight Agent.

E. C. Cockrell, Chief Clerk to the General Passenger Agent of the Chicago, Indianapolis & Louisville, has been appointed Assistant General Passenger Agent, with headquarters at Chicago.

William H. Paul, who has been for seventeen years connected with the Denver & Rio Grande in various positions, has resigned as General Agent at Goldfield, to engage in other business.

E. G. Lutz has been appointed Commercial Agent of the Atlanta & West Point and the Western of Alabama at Montgomery, Ala., succeeding W. J. Parker, on leave of absence on account of illness.

W. P. Guttery has been appointed Dining Car Inspector of the Chicago & Alton and Toledo, St. Louis & Western. Mr. Guttery was formerly one of the oldest dining car conductors on the Chicago, Burlington & Quincy.

George D. O'Connor, whose resignation as Traveling Freight Agent of the Northern Pacific has been published in these columns, has been appointed Traffic Manager of the Walla Walla Valley Traction Co., Walla Walla, Wash.

A. R. Brasted, Soliciting Freight Agent of the Chicago, Rock Island & Pacific and the St. Louis & San Francisco at Denver, Colo., has been appointed Traveling Freight Agent at Denver. George Nichols succeeds Mr. Brasted.

C. D. Whitney, Assistant General Freight Agent of the Missouri & North Arkansas, has been appointed Traffic Manager, with office at Eureka Springs. W. S. Roberts, General Passenger Agent, has resigned, his office remaining vacant for the present.

J. L. Boyd, General Agent at Lake Charles, La., of the Kansas City Southern and the Texarkana & Fort Smith, has been appointed General Agent of the Freight department at Beaumont, Tex., succeeding J. C. Mow, appointed Contracting Freight Agent. F. E. Haskell, with the title of Commercial Agent, succeeds J. L. Boyd.

H. C. Snyder, Division Freight Agent of the Erie at Buffalo, N. Y., has been appointed Assistant General Freight Agent of the lines west of Buffalo and Salamanca, with office at Chicago, succeeding G. B. Whittlesey. C. W. Clark, General Freight Agent of the lines west of Buffalo and Salamanca, succeeds Mr. Snyder; H. W. Forward, Division Freight Agent, Chicago district, succeeds Mr. Clark; F. G. Lantz succeeds Mr. Forward.

J. F. Logan, Traveling Passenger Agent of the Southern Railway at St. Louis, Mo., has been appointed Traveling Passenger Agent at Louisville, Ky. F. C. Richardt, City Passenger Agent at St. Louis, succeeds Mr. Logan as Traveling Passenger Agent at that place. D. M. Nation has been appointed City Ticket Agent at Louisville, Ky., and A. C. Mathias has been appointed City Passenger Agent at St. Louis, succeeding Mr. Richardt.

The following appointments have been made on the Trinity & Brazos Valley: J. I. Johnson, Commercial Agent, with headquarters at Galveston, Tex.; J. N. Steel, Traveling Freight and Passenger Agent, with headquarters at Houston, Tex.; W. A. Schrivner, Traveling Freight Agent, with headquarters at Fort Worth, Tex.; H. P. Bonner, Contracting Agent, with headquarters at Dallas, Tex.; T. G. Frazee, Contracting Agent, with headquarters at Fort Worth.

R. L. Arnett has been appointed Commercial Freight Agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, at Fort Scott, Kan., succeeding F. L. Huesmann, deceased. C. C. Carson has been appointed District Passenger Agent at Joplin, Mo. The following officers have been appointed Traveling Passenger Agents: J. A. Steltenkamp, at Cincinnati, Ohio; W. Delaney at St. Louis, Mo.; Thomas Hughes at Omaha, Neb.; and W. W. Richmond at Little Rock, Ark. H. L. Pease has been appointed City Passenger Agent at Chicago, and Frank P. Prosser has been appointed City Passenger Agent at Joplin, Mo.

R. E. Eggebrecht, Assistant General Freight Agent of the St. Louis, Iron Mountain & Southern, with office at St. Louis, Mo., has been appointed Assistant General Freight Agent of the Missouri Pacific also. He will have supervision over matters pertaining to coal, grain and grain products. E. H. Calef has been appointed Assistant General Freight Agent of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, at St. Louis, Mo. He will have supervision over matters pertaining to cotton and its products, lumber and forest products. W. A. Rambach has been appointed Assistant General Freight Agent at St. Louis, Mo., succeeding E. B. Lane, resigned. The position of General Freight Agent of lines in Missouri is abolished. A. T. Stewart, Assistant General Freight Agent, has been appointed Assistant to the Vice-President in charge of traffic, with office at St. Louis.

Engineering and Rolling Stock Officers.

C. C. Smythe has been appointed Acting General Foreman of the Bridge and Building department of the Chicago, Cincinnati & Louisville, with office at Peru, Ind., succeeding S. H. Shinn, resigned.

J. J. Sullivan, Master Mechanic of the Louisville & Nashville at Louisville, Ky., has been transferred as Master Mechanic to New Decatur, Ala., succeeding H. C. May, who was transferred as Master Mechanic to Louisville.

R. M. White, Resident Engineer of the Delaware, Lackawanna & Western at Buffalo, N. Y., has been appointed Division Engineer, succeeding G. J. Ray. The duties of Mr.

White's former position have been assumed by C. E. Wickham, Division Engineer at Binghamton, N. Y.

D. P. Beach, Engineer of Maintenance of Way of the Cincinnati & Muskingum Valley, has been appointed Engineer of Maintenance of Way of the Pennsylvania Lines West, succeeding F. H. Watts, at Indianapolis, Ind. Mr. Watts has been appointed Engineer of Maintenance of Way of the Pennsylvania Lines West at Logansport, Ind., succeeding Frank Rhea, resigned. E. B. Taylor, Jr., succeeds Mr. Beach.

Special Officers.

Mortimer U. Randel has been appointed General Immigration Agent of the Chicago, Burlington & Quincy in Colorado, Wyoming and Montana, with headquarters at Denver, Colo.

Storekeepers.

A. H. Morris has been appointed General Storekeeper of the Oregon Railroad & Navigation, the Southern Pacific lines in Oregon, the Washington & Idaho and the Corvallis & Eastern, with office at Portland, Ore., succeeding A. H. Cunningham, resigned.

OBITUARY.

F. L. Huesmann, Commercial Agent of the Missouri Pacific at Fort Scott, Kans., died at Ann Arbor, Mich., on August 29.

William T. Bergs, formerly Traveling Freight Agent of the Chicago, Peoria & St. Louis, died at St. Louis, Mo., on August 26.

F. H. Garfield, Division Freight Agent of the Erie at Jamestown, N. Y., died at his home in Jamestown on August 31. He was 54 years old and had worked for the Erie for 31 years.

Frank P. Sargent, Commissioner General of Immigration and Grand Master of the Brotherhood of Locomotive Firemen, died September 4 in Washington, D. C. He was 54 years old.

Frank H. Hummel, Traveling Passenger Agent of the Union Pacific at Denver, Colo., died in that city August 24 at the age of 41 years. Mr. Hummel had been connected with the Union Pacific for 24 years.

H. M. Minto, formerly Master Mechanic of the Louisville & Nashville, died at his home in Mobile, Ala., on August 24 at the age of 60 years. Mr. Minto began railroad work in 1862 as apprentice machinist of the Grand Trunk. From 1869 to 1873 he was machinist on the New Orleans, Jackson & Great Northern, now a part of the Illinois Central, and from the latter date until 1891 he was machinist and locomotive engineer on the Louisville & Nashville. In 1891 he was appointed Master Mechanic of the same road, which position he resigned in January, 1907.

Lewis Williams, Manager of the Cleveland Car Service Association, died on August 29 in Los Angeles, Cal. Mr. Williams was born at Brimfield, Mass., in 1837. After graduating from Yale in 1856, he worked on the construction of the Milwaukee & La Crosse, now part of the Chicago, Milwaukee & St. Paul. From 1863 to 1881 he was successively Superintendent, General Superintendent and General Manager of the Cincinnati, Hamilton & Dayton. He was the first General Manager of the New York, Chicago & St. Louis, from which position he retired in 1893 on account of illness.

W. C. Modisett, General Freight and Passenger Agent of the Green Bay & Western and the Kewaunee, Green Bay & Western, died at Green Bay, Wis., on September 1. Previous to 1888 Mr. Modisett was agent of the St. Louis, Keokuk & Northwestern at Louisiana, Mo., and from 1888 to 1890 was General Agent of the Chicago, Burlington & Quincy at Hannibal, Mo. From the latter year until 1892 he was General Baggage Agent of the Quincy, Omaha & Kansas City and later in 1892 became General Agent of the St. Louis & Hannibal, which position he held until 1895. From 1895 until 1901 he was General Freight and Passenger Agent of the same road. In 1901 he was appointed General Freight and Passenger Agent of the Green Bay & Western, which position he held until his death.

Railroad Construction.

New Incorporations, Surveys, Etc.

Alabama, Tennessee & Northern.—This company has opened for operation an extension from Aliceville, Ala., south to Cochrane, 9 miles. Grading from the latter place south to a point in Sumter county is said to be finished for 10 miles.

Appalachian Railway.—Organized to open for development 70,000 acres of timber lands by building a line from Whittier, N. C., northwest about 45 miles to a point in Tennessee, probably Sevierville. J. C. Arbogast is General Manager, Asheville, N. C., and R. Grey, Engineer in charge, Bristol, Tenn.

Arkansas Roads.—Moore & McFerren, Luxora, Ark., want to hear from contractors with team outfit, to grade seven miles of railroad in northeast Arkansas. The work involves the handling of 75,000 to 80,000 cu. yds. of earth.

Bakersfield & Ventura Railroad.—An officer writes that this company is now operating 25 miles of railroad in Ventura County, Cal., with steam locomotives and also with gasolene motor cars. Surveys have been made covering all the governing points between Los Angeles, Cal., and San Francisco; also for numerous branches. The principal work will be through valleys, with about 100 miles of mountain work, and a 2-mile tunnel. The maximum grade will be 2 per cent. compensated, with 8 deg. curvature. The line as projected between Los Angeles and San Francisco is to be 60 miles shorter than any existing line between these places. It is the intention of the company to continue the use of steam locomotives and gasolene motor cars on the entire system when finished. C. T. Carnahan is President, and T. B. Blackburn General Manager and Chief Engineer, with office at Oxnard, Cal. (August 14, p. 740.)

Canadian Northern.—Local reports are that this company will build a line from Toronto, Ont., to Buffalo, N. Y., about 100 miles and that work is to begin early in the spring.

At noon on September 4 the ballast gang of the Brandon-Regina branch reached a point in sight of Regina, Sask. It is expected that regular train service will be in operation on this branch before the end of the present month.

Canadian Pacific.—The Walkerton & Lucknow has been extended from Hanover, Ont., west to Walkerton, 10 miles. The line is now in operation from Saugeen Junction, on the Toronto, Orangeville-Owen Sound line, west to Walkerton, 38 miles. (R. R. G., March 13, p. 396.)

Definite arrangements have been made to rush construction of the Shedo branch to Lanigan, Sask. The railroad company will assist the contractors in the grading if necessary.

Chicago, Wheaton & Western (Electric).—Incorporated with $10,000 capital to build a line which will tap the region north of Wheaton, Ill., and will connect the Aurora, Elgin & Chicago with West Chicago. The incorporators are: J. Sidney Condit, J. Percy Strickland, D. W. Peters, R. B. Tabor and H. C. Wood, all of Chicago.

Coweta, Franklin & Troup.—Incorporated in Georgia with $300,000 capital to build a line from a point on the Atlanta & West Point or the Central of Georgia, in Coweta county, Ga., southwest through Heard county to a point on the Atlanta, Birmingham & Atlantic, in Troup county. The incorporators include J. W. Daniel, J. W. Ray and B. H. Tompkins, of Heard county; W. A. Brannan and W. C. Wright, of Newnan, and J. E. Duncan, of La Grange.

Des Moines & Sioux City (Electric).—An officer writes that right of way is being obtained and that the building of the line will very likely begin next year. About 135 miles of road will be built at an estimated cost of $26,000 a mile. M. H. Miller, Vice-President and General Manager, Fort Dodge, Iowa. (July 24, 1908, p. 600.)

Estacado & Gulf.—The laying of the steel on this road between McCauley, Tex., and Roby was begun last week. The management expects to have trains in operation between these two points by November 1. A corps of surveyors is locating a

route eastward, and grading will begin as soon as a permanent survey has been established. (July 10, p. 505.)

EVANSVILLE & EASTERN RAILWAY.—A sub-company of the Evansville & Eastern Railway Co. has been incorporated to build an electric line from Rockport, Ind., east to New Albany, and across the Ohio river to Louisville Ky. The line will pass through Grandview, Indiana, Troy, Tell City and Cannelton. The capital stock is given at $10,000, but it is stated that an amendment will soon be filed increasing it to $1,000,000. The directors include Wm. H. McCurdy, of Evansville; John C. Haines, Marcus S. Sonntag, Albert F. Karges, Wm. A. Kotch, C. H. Battin and Wm. L. Sonntag.

GENESEE & ORLEANS (ELECTRIC).—An officer writes that this company, incorporated with $350,000 capital, has preliminary surveys made and rights of way secured for an electric line from Batavia, N. Y., north to the government harbor, Point Breeze, known as "Oak Orchard," on Lake Ontario, 27 miles. The franchise calls for a road of standard construction. Bids are being asked for the construction of the road. Geo. W. Mische, of Geo. W. Mische & Co., Rochester, N. Y., has bought an option on the franchise, consents, etc., and is to secure the finances for the construction of the line.

GRAND RAPIDS & NORTHWESTERN.—Walter S. Syrett, President of the National Construction Co., Chicago, which is building G. R. & N-W. from Grand Rapids, Mich., to Ludington, writes that a contract for the first 20 miles of grading, bridging and fencing has been let to John Doyle, of Grand Rapids. Also that this line will extend along the west shore of Ludington harbor so as to handle trans-lake and car ferry traffic and will occupy the Bridge street terminal at Grand Rapids in conjunction with the Grand Trunk. Marshall F. Butters, of Ludington, is President of the railroad company.

GRAND TRUNK.—See Grand Rapids & Northwestern.

GRAND TRUNK PACIFIC.—Ross & Carlson, who had a subcontract on the line east of Prince Rupert, B. C., are said to have given up their contract.

GREAT NORTHERN.—Work of laying rails on the Billings & Northern line from Billings, Mont., to Laurel, will be completed about November 1. The ballasting of the remainder of the line will soon be completed. A. H. Hogeland, Chief Engineer, St. Paul, Minn. (R. R. G., March 13, p. 391.)

KANSAS SOUTHERN & GULF.—This company is preparing plans for a direct route from Omaha, Neb., to Wichita, Kan., about 274 miles. The proposed line will utilize some of the road already constructed and, it is said, will shorten the distance between Omaha and Wichita by 102 miles.

KEWEENAW CENTRAL.—A new line called the Lac La Belle branch has been opened for operation from Lac La Belle Junction, Mich., north to Lac La Belle, 6½ miles.

LIMA & TOLEDO TRACTION.—See Ohio Electric.

LOGANSPORT, FRANKFORT & INDIANAPOLIS TRACTION.—Incorporated with a capital stock of $25,000 to build an electric line from Frankfort, Ind., north to Logansport, 35 miles. The directors include: S. H. Blakeslee, Allen G. Barane, Eben Miller, Frank Sargent, all of Cleveland, Ohio; Wm. W. Palmer, New York; Ephraim A. Thomas, Pittsburgh, Pa., and W. P. Clark, Kent, Ohio.

MARSHALL & EAST TEXAS.—This company, which is the new name of the Texas Southern, operating a railroad from Winnsboro, Tex., on the Missouri, Kansas & Texas southeast 74 miles to Marshall, on the Texas & Pacific, is to be improved by the new owners at a cost of $100,000. All the work is to be done by the company's men. According to reports from Marshall the road is to be extended from that place south about 225 miles to a connection with the St. Louis, Brownsville & Texas near Houston, also north from Winnsboro, probably to a connection with the St. Louis & San Francisco, at Paris, about 50 miles

According to advices, work has been begun on reballasting portions of the roadbed and laying new ties. The company has contracted for 8,000 ties and about 90,000 more will be needed before the work is completed. About 150 men are at work repairing the bridges and road and the shop forces have been increased to rebuild a considerable part of the rolling stock. (Aug. 28, p. 839.)

MISSISSIPPI RIVER WESTERN.—Incorporated to build from Meridian, Miss., southwest to Natchez. Ex-Governor A. H. Longino is said to be one of the parties interested.

MISSOURI, KANSAS & TEXAS.—An officer writes regarding improvement being made as follows: New division yard at Wagoner, Okla., contract for team work let to W. C. Williams, of St. Paul, Kan. The steam shovel work, which is the largest portion of the grading, as well as the concrete and the track work, is being done by the railroad company's forces.

At McAlester, Okla., enlarging the yard for division yard purposes, grading is being done by Wogan & Wilson, formerly of Kansas City, and now located on the work. The concrete and track work will be done by the railroad company's men.

At Fort Worth, Tex., work has been resumed on the division freight yard, team work let to Denis Fegan, of Denison, and the railroad company's men are doing the steam shovel and concrete work.

At Dallas, Tex., enlarging the yard, the steam shovel and concrete work is being done by the railroad forces, and the team work by A. F. Moberly, of Dallas. The concrete work embraces drains, depressed cinder pits, etc.

MONROE, FARMERSVILLE & HOPE.—An officer writes that a line is being promoted from Monroe, La., to Hope, Ark., and that within the next two months it is expected that the construction of 30 miles of roadbed will be commenced. D. H. Nichols, P. O. Box 509, Monroe, La. (Sept. 4, p. 889.)

NEW YORK, NEW HAVEN & HARTFORD.—In asking for an amended franchise, with the additions as outlined by President Mellen, of the New Haven, before the New York Public Service Commission, First district, two weeks ago, the New York, Westchester & Boston asks for the right to build an overhead electric trolley system, giving the city of New York the right to string three cables instead of placing two conduits. The company also desires to connect its proposed road with the subway at West Farms. Permission is asked to extend the time for the completion of the four-track road from the city limits south to 174th street to Aug. 2, 1911, and for the line from 174th street south to the Harlem river to Aug. 2, 1913. The northern part is through rather open country, while the rest is built up.

NORTH JERSEY RAPID TRANSIT.—Bids are wanted up to Sept. 15, at the office of this company, Colt building, Paterson, N. J., for the grading, masonry and bridge work on the first section of the projected electric line from Paterson, N. J., north to Suffern, N. Y., 16 miles. W. A. Barbour, President. (Aug. 21, p. 788.)

OHIO ELECTRIC.—The Springfield-Lima division in operation from Springfield, Ohio, north to Bellefontaine, 32 miles, has been extended from Bellefontaine north to Lima, 40 miles. The Lima & Toledo Traction, whose capital stock is owned by the Ohio Electric, operating from Lima north to Deshler, 35 miles, has been extended from Deshler northeast to Toledo, about 50 miles; both these extensions are now in operation.

OMAHA, COUNCIL BLUFFS & DES MOINES.—Incorporated to build an electric line from Omaha, Neb., east to Des Moines, Ia. The proposed line will be from Omaha to Council Bluffs, Ia., thence northeast through Shelby to Harlan and then east, between the lines of the Chicago Milwaukee & St. Paul and the Chicago, Rock Island & Pacific, through Audubon, Guthrie Center, Dale, Redfield, Adel and to Des Moines. This is a new line of the Miller system of roads which includes the Sioux City & Spirit Lake Electric, reported in our issue of September 4. The officers of the road are: J. W. Russell, President, Adel, Ia.; F. M. Hopkins, Vice-President, Guthrie Center; H. H. Miller, Secretary, Ft. Dodge; E. L. Lockwood, Treasurer. At a meeting of the company held on August 31, the Secretary said that the financial arrangements were about completed and that work upon the road would be begun without delay.

PACIFIC & IDAHO NORTHERN.—E. M. Heigho, Vice-President and Treasurer, Weiser, Idaho, has given out the statement that this line will be extended next year to Roseberry, Idaho, in the Long Valley wheat belt, and that work will begin as early in the spring as the weather will permit. Roseberry is 45 miles from Evergreen, the present terminus of the road.

Pacific Railway & Navigation.—Construction work on this road, which was stopped last November, has been resumed, and it is expected that the line will be completed by June, 1910. The road will be completed from Hillsboro, Ore., west to Tillamook, 86 miles, 19 of which are already in operation. Work will be done from both the Tillamook and the Hillsboro ends. (June 14, p. 879.)

Pennsylvania Roads (Electric).—Surveys were begun recently for an electric line projected by Butler, Pittsburgh and Franklin, Pa., capitalists. The selected route is from Butler, Pa., north via Oneida, Queens, Euclid, Slippery Rock, Grove City and Greenville to Conneaut Lake, 70 miles, with a branch eastward to Franklin. The project, it is said, has the necessary financial backing, but work is not to be begun until business conditions improve.

Pittsburg, Shawmut & Northern.—This company has opened for operation a new line called the Knoxdale branch from Colon, Pa., to Knoxdale, 3 miles.

Rogue River & Oregon Southern.—Incorporated in Oregon to build a line from Grant's Pass, Ore., on the main line of the Oregon Railroad & Navigation Company, to Waldo, about 50 miles. The line proposes to traverse the Rogue river valley for some distance, and will tap a rich section of timber country. O. S. Blanchard, Glenville A. Collins and H. B. Buddenborg, all of Grant's Pass, Ore., are the incorporators. An office will be maintained at Grant's Pass, but the principal business office will be at Seattle, Wash. The capital stock is fixed at $1,000,000.

Terminal Railroad Association of St. Louis.—See St. Louis, Mo., under Railroad Structures.

Texas & New Orleans.—It is said that this road has given a contract to the Suderman-Dolson Co., Galveston, Tex., for ties for building an extension eight miles long.

Texas Southern.—See Marshall & East Texas.

Walkerton & Lucknow.—See Canadian Pacific.

Wasiota & Black Mountain.—An officer writes that a contract has been let to T. J. Asher & Sons for building ten miles of line from Wasiota, Ky., on the Louisville & Nashville, north to developed coal fields. Track has been laid on about a half a mile. The work to be carried out includes one bridge and one tunnel. T. J. Asher, President; A. B. Gloster, Chief Engineer, Middlesboro, Ky. (Aug. 14, p. 441.)

Wichita Falls & Northwestern System.—The Wichita Falls & Southern, building an extension from Olney, Tex., south to Belknap, 14 miles, has the line finished and in operation on the first 12½ miles from Olney south to Newcastle. (June 19, p. 209.)

Wichita Falls & Southern.—See Wichita Falls & Northwestern System.

Railroad Financial News.

Boston & Maine.—A quarterly dividend of 1½ per cent. was declared on September 3 on the $28,271,790 common stock outstanding. This reduces the annual rate from 7 per cent., paid since 1899, to 6 per cent.

Canadian Pacific.—Stockholders will be asked to vote to increase the capital stock from the present authorized issue of $150,000,000 to $200,000,000. The stock is to be issued from time to time at the discretion of the directors.

Chicago, Rock Island & Pacific.—The interest due September 1 on the $17,364,180 Chicago, Rock Island & Pacific 5 per cent. bonds, secured by a deposit of nearly all of the St. Louis & San Francisco common stock, was paid as usual.

Denver City Tramway.—An issue of $25,000,000 first and refunding mortgage 5 per cent. 30-year bonds has been authorized, of which $13,000,000 bonds are to be reserved to retire outstanding bonds, and $12,000,000 to be issued for new lines and extensions.

Erie.—J. P. Morgan & Co., New York, will continue to purchase at par coupons due September 1, 1908, from the following bonds:

New York & Erie second mortgage 5 per cent.
New York & Erie third mortgage 4½ per cent.
Erie Railway consolidated 7 per cent.
New York, Lake Erie & Western first consolidated 7 per cent.
New York, Pennsylvania & Ohio prior lien 4½ per cent.

Interstate Railways.—This Philadelphia company paid, on August 1, the interest, amounting to $215,532, on its collateral trust bonds. On September 1 interest payment on $650,000 first mortgage 5 per cent. bonds of the Philadelphia, Bristol & Trenton Street Railway was defaulted. The P., B. & T. is controlled by the Interstate Railways through the United Power & Transportation Co.

Mexican Central.—The $1,225,000 outstanding three-year 5 per cent. notes, maturing September 18, 1908, are to be paid principal and interest.

New Mexican Central.—This is the new name of the Santa Fe Central, which runs from Sante Fe, N. Mex., south to Torrence, 117 miles.

Norfolk & Southern.—A plan of the reorganization committee has been announced, which provides for a new company with $16,000,000 stock, and $12,000,000 first mortgage 50-year 5 per cent. bonds, to be secured by a mortgage on all the property of the company, with the exception of the bonds or property of the John L. Roper Lumber Co. If this plan is adopted, the annual fixed charges will be reduced from $1,270,746, the amount at present, to $605,516.

Philadelphia Rapid Transit.—It is said that this company has made a proposal to the city councils to charge a straight 5-cent fare instead of selling six tickets for a quarter, and to sell working men's tickets at reduced prices, the tickets good between 6 and 8 a.m., and 6 and 8 p.m.

Santa Fe Central.—See New Mexican Central.

Sciota Valley Traction.—The stockholders will be asked at a special meeting September 22, to authorize an issue of $1,600,000 5 per cent. bonds, and the sale of $300,000 first preferred stock. This method of financing the traction company's needs is considered by the directors better than the previously proposed plan to issue $2,000,000 5 per cent. bonds.

Seaboard Air Line.—Default having been made in the payment of interest due September 1 on the Atlanta-Birmingham division first mortgage 4 per cent. bonds of 1903-1933, the following protective committee has been formed: William Salomon, Chairman; Paul Morton, Benjamin S. Guinness, F. J. Lisman, and M. V. R. Weyant, Secretary, 25 Broad street, New York. The Atlanta-Birmingham bonds are a first mortgage on 198 miles of road, and a direct obligation of the Seaboard Air Line.

Southern Indiana.—The first mortgage bondholders' protective committee, A. G. Hodenpyl, Chairman, announces that more than a majority of the first mortgage bonds have been deposited under the protective agreement of this committee. Bonds will be received for deposit up to and including October 1, 1908. (September 4, p. 890.)

Tarrytown, White Plains & Mamaroneck.—Interest, due September 1, on the first mortgage 5 per cent. bonds has not been paid.

Wabash.—A decision of the Supreme Court of New York gives the Buffalo Terminal Association the right to recover from the city of Buffalo, N. Y., about $1,048,000. This is the principal and interest of the sum paid for the Hamburg canal strip.

Wabash-Pittsburgh Terminal.—Suit has been brought in the United States court at Pittsburgh, Pa., to foreclose the first mortgage dated May 10, 1904, under which there are now outstanding $30,088,000 4 per cent. bonds.

Wheeling & Lake Erie.—The interest due September 1 on the first consolidated 4 per cent. bonds of 1899-1949, of which there are $11,697,000 outstanding, was paid as usual. The funds were obtained through the sale of $233,940 receiver's certificates. The decision in regard to the application to issue $3,000,000 certificates has been deferred.